B.Tech


KALASALINGAM
ACADEMY OF RESEARCH & EDUCATION
(DEEMED TO BE UNIVERSITY)
Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A" Grade
Anand Nagar, Krishnankoil - 626126. Srivilliputtur (Via), Virudhunagar (Dt), Tamil Nadu | info@kalasalingam.ac.in | www.kalasalingam.ac.in


# CURRICULUM AND SYLLABUS

## (CHOICE BASED CREDIT SYSTEM)

## REGULATION - 2021

# DEPARTMENT OF INFORMATION TECHNOLOGY

B.TECH.,

CURRICULUM

2021

SCHOOL OF COMPUTING

DEPARTMENT OF INFORMATION TECHNOLOGY

KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION

(DEEMED TO BE UNIVERSITY)

(Under Section 3 of the UGC Act 1956)

Anand Nagar, Krishnankoil - 626126.

Srivilliputtur, Virudhunagar (Dist.), Tamil Nadu, India

(Website: https://kalasalingam.ac.in/)

## KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION

### VISION

To be a University of Excellence of International Repute in Education and Research

### MISSION

M1. To provide a scholarly teaching-learning ambience which results in creating graduates equipped with skills and acumen to solve real-life problems.

M2. To promote research and create knowledge for human welfare, rural and societal development.

M3. To nurture entrepreneurial ambition, industrial and societal connect by creating an environment through which innovators and leaders emerge

## DEPARTMENT OF INFORMATION TECHNOLOGY

### VISION

To be a department of repute offering programmes in frontier areas of ITthrough quality education, research and imbibing societal values.

### MISSION

M1. To provide quality education through effective curriculum and innovative teaching.

M2. To facilitate conductive learning environment for students and faculty to investigate knowledge.

M3. To instill the ethical behavior and social responsibilities to provide sustainable information technology solutions

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Within few years after graduation, our graduates will:

PEO-1. The graduates will be successful IT professionals in their chosen area and / or pursue higher studies.

PEO-2. The graduates will comprehend, analyze, design and create novel products and technologies that provide sustainable solutions.

PEO-3. The graduates will demonstrate multidisciplinary knowledge, personal and interpersonal skills and work as an effective team member with ethical standards.

## ABET STUDENT OUTCOMES (SO)

**SO1.** Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

**SO2.** Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

**SO3.** Communicate effectively in a variety of professional contexts.

**SO4.** Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

**SO5.** Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

**SO6.** Use systemic approaches to select, develop, apply, integrate, and administer secure computing technologies to accomplish user goals.

**KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION**

**DEPARTMENT OF INFORMATION TECHNOLOGY**

B.Tech., IT - CURRICULUM STRUCTURE

| S.No | Curriculum Components | Credits |
|---|---|---|
| I | **Foundation Core** | 44 |
| | Mathematics and Sciences | |
| | Engineering Sciences | |
| | Computing | |
| | Sustainable Product Development | |
| | Human Values and Communication | |
| | Entrepreneurship and Innovation | |
| II | **Program Core** | 52 |
| III | **Program Elective** | 24 |
| IV | **University Elective** | 16 |
| | Engineering (outside school) | |
| | Liberal arts (or) Mathematics and Sciences | |
| V | **Experiential Core** | 16 |
| | Design Project | |
| | Capstone | |
| VI | **Experiential Elective Courses** | 8 |
| | CSP / Internship / UG Research / Competitions | |
| VII | **Honors Elective** | 20* |
| | Total Credits | 160 |

**Program Core Courses (52 Credits)**

| S.No. | Course Code | Course Name | Course Type (TC/PC/IC-T/IC-P) | Credits |
|---|---|---|---|---|
| 1 | 212INT1401 | Web Application Development | IC-P | 4 |
| 2 | 212INT2301 | Digital Logic and Design | IC-T | 4 |
| 3 | 212INT2302 | Operating Systems Concepts | IC-T | 4 |
| 4 | 212INT2303 | Data Structures and Algorithms | IC-T | 4 |
| 5 | 212INT2304 | Object Oriented Programming using Java | IC-T | 4 |
| 6 | 212INT2305 | Embedded Systems and Technology | IC-T | 3 |
| 7 | 212INT3301 | Data Communications and Computer Networks | IC-T | 4 |
| 8 | 212INT2306 | Information Storage, Modelling and Retrieval | IC-T | 4 |
| 9 | 212INT2307 | Software Construction and Management | IC-T | 4 |
| 10 | 212INT3302 | Data Science and Data Visualization | IC-T | 4 |
| 11 | 212INT1101 | Computer Organization and Assembly Language Programming | T | 3 |
| 12 | 212INT2101 | Discrete Mathematics | T | 4 |
| 13 | 212INT2308 | Artificial Intelligence | IC-T | 3 |
| 14 | 212INT2102 | Cyber Security and Forensics | T | 3 |

**Program Elective Courses (24 Credits)**

| S.No. | Course Code | Course Name | Course Type (T /PC /IC-T /IC-P) | Credits |
|---|---|---|---|---|
| 1 | 213INT1101 | Augmented Reality and VirtualReality | T | 3 |
| 2 | 213INT1102 | Object Oriented Analysis and Design | T | 3 |
| 3 | 213INT1103 | Enterprise Resource Planning | T | 3 |
| 4 | 213INT1104 | Software Project Management | T | 3 |
| 5 | 213INT1105 | Digital Marketing | T | 3 |
| 6 | 213INT1106 | Signals and Systems | T | 3 |

| S.No. | Course Code | Course Name | Course Type (T /PC /IC-T /IC-P) | Credits |
|---|---|---|---|---|
| 7 | 213INT1107 | Cyber Physical Systems | T | 3 |
| 8 | 213INT1108 | 5G Networks | T | 3 |
| 9 | 213INT1109 | Edge Computing | T | 3 |
| 10 | 213INT1110 | Bio Informatics | T | 3 |
| 11 | 213INT1301 | Information Coding Techniques | IC-T | 4 |
| 12 | 213INT1302 | Digital Image Processing | IC-T | 3 |
| 13 | 213INT1303 | Parallel and Distributed Computing | IC-T | 3 |
| 14 | 213INT1304 | Statistics with R Programming | IC-T | 4 |
| 15 | 213INT1305 | Data Warehousing and Mining | IC-T | 4 |
| 16 | 213INT1306 | Big Data Analytics | IC-T | 4 |
| 17 | 213INT1307 | Full stack software Development | IC-T | 3 |
| 18 | 213INT1308 | Principles of Digital Signal Processing | IC-T | 4 |
| 19 | 213INT1309 | Information Security | IC-T | 4 |
| 20 | 213INT1310 | Blockchain Technology | IC-T | 4 |
| 21 | 213INT1311 | Neural Networks and Fuzzy Logic | IC-T | 4 |
| 22 | 213INT1312 | Soft Computing | IC-T | 4 |
| 23 | 213INT1313 | Deep Learning | IC-T | 4 |
| 24 | 213INT1314 | Web services | IC-T | 3 |
| 25 | 213INT1315 | Managing the cloud | IC-T | 3 |
| 26 | 213INT1316 | Robotic Programming | IC-T | 4 |
| 27 | 213INT1317 | Statistics Foundation of Data Science | IC-T | 4 |
| 28 | 213INT2301 | Data Analysis Using Python | IC-T | 4 |
| 29 | 213INT2302 | Principles of Compiler Design | IC-T | 4 |
| 30 | 213INT2303 | Programming with Open-Source Software | IC-T | 4 |
| 31 | 213INT2304 | Formal Language and Automata | IC-T | 4 |
| 32 | 213INT2305 | Speech and Natural Language Processing | IC-T | 3 |
| 33 | 213INT2306 | System Software | IC-T | 4 |
| 34 | 213INT2307 | Distributed Systems | IC-T | 4 |
| 35 | 213INT2308 | Service Oriented Architecture | IC-T | 3 |

| S.No. | Course Code | Course Name | Course Type (T /PC /IC-T /IC-P) | Credits |
|---|---|---|---|---|
| 36 | 213INT2309 | Real Time Systems | IC-T | 3 |
| 37 | 213INT2310 | Design and Analysis of Algorithms | IC-T | 4 |
| 38 | 213INT2311 | Component Based Technology | IC-T | 4 |
| 39 | 213INT2312 | C# and .NET Programming | IC-T | 4 |
| 40 | 213INT2313 | Mobile Application Development | IC-T | 4 |
| 41 | 213INT2314 | Software Quality Assurance | IC-T | 3 |
| 42 | 213INT3301 | Game Programming | IC-T | 4 |
| 43 | 213INT3302 | Multimedia and Computer Graphics | IC-T | 4 |
| 44 | 213INT3303 | Graph Theory | IC-T | 4 |
| 45 | 213INT3304 | Machine Learning | IC-T | 4 |
| 46 | 213INT3305 | Advanced DBMS | IC-T | 4 |
| 47 | 213INT3306 | Information Storage Management | IC-T | 4 |
| 48 | 213INT3307 | Bluetooth Technology | IC-T | 4 |
| 49 | 213INT3308 | Wireless Sensor Networks | IC-T | 4 |
| 50 | 213INT3309 | Industrial IoT | IC-T | 4 |
| 51 | 213INT3310 | Network Design Security and Management | IC-T | 4 |
| 52 | 213INT3311 | Mobile Networks | IC-T | 4 |
| 53 | 213INT3312 | High Performance Networks | IC-T | 4 |
| 54 | 213INT3313 | Cryptography and Network Security | IC-T | 4 |
| 55 | 213INT3314 | Cloud Computing | IC-T | 4 |
| 56 | 213INT3315 | Green Computing | IC-T | 3 |
| 57 | 213INT3316 | Mobile Communication and Computing | IC-T | 4 |
| 58 | 213INT3101 | Wireless Application Protocol | T | 3 |
| 59 | 213INT3102 | Computer Forensics | T | 3 |
| 60 | 213INT3103 | Social Network Analysis | T | 3 |
| 61 | 213INT3104 | Information Retrieval Techniques | T | 3 |

**University Elective Courses (16 Credits)**

| S.No. | Course Code | Course Name | Course Type (TC/PC/IC-T/IC- P) | Credits |
|---|---|---|---|---|
| 1 | 214INT1301 | Web Programming | IC-T | 3 |
| 2 | 214INT1302 | Introduction To Information Security | IC-T | 3 |
| 3 | 214INT1303 | Essentials Of Information Technology | IC-T | 3 |
| 4 | 214INT1304 | R Programming | IC-T | 3 |
| 5 | 214INT1305 | Programming With C++ And Java | IC-T | 3 |
| 6 | 214INT1306 | IT in Business | IC-T | 3 |
| 7 | 214INT2301 | Big Data Analytics | IC-T | 3 |
| 8 | 214INT2302 | Information Theory & Coding | IC-T | 3 |
| 9 | 214INT2303 | Cyber Forensics | IC-T | 3 |
| 10 | 214INT2304 | Internet And Java | IC-T | 3 |
| 11 | 214INT2305 | Network Protocols | IC-T | 3 |
| 12 | 214INT2306 | Introduction To Storage Management | IC-T | 3 |
| 13 | 214INT2307 | Principles and Practices of Communication Systems | IC-T | 3 |
| 14 | 214INT2308 | Software Testing | IC-T | 3 |
| 15 | 214INT2309 | Embedded C Programming | IC-T | 3 |
| 16 | 214INT2310 | Embedded System Automation | IC-T | 3 |
| 17 | 214INT2311 | System on Chip Design | IC-T | 3 |
| 18 | 214INT3301 | High Speed Networks | IC-T | 3 |
| 19 | 214INT3302 | Multimedia coding and Communications | IC-T | 3 |

**Experiential core Courses (16 credits)**

| S.No. | CourseCode | Course Name | Course Type (TC/PC/IC-T/IC-P) | Credits |
|---|---|---|---|---|
| 1 | 215EXS2201 | Design-Build | PC | 3 |
| 2 | 215EXS3201 | Design-Build-Operate | PC | 3 |
| 3 | 215INT4201 | Capstone Project | PC | 10 |

**Experiential Elective Courses (8 Credits)**

| S.No. | CourseCode | Course Name | Course Type (TC/PC/IC-T/IC-P) | Credits |
|---|---|---|---|---|
| 1 | 216INT2201 | Industry Internship | PC | 2 |
| 2 | 216INT2202 | Industrial Training | PC | 2 |
| 3 | 216INT2203 | Competitive Programming | PC | 1 |
| 4 | 216INT2204 | Micro Project | PC | 1 |
| 5 | 216INT4221-1 | Community Service Project | PC | 3 |

**Honors Elective Courses (20 Credits)**

| S.No. | CourseCode | Course Name | Course Type (TC/PC/IC-T/IC-P) | Credits |
|---|---|---|---|---|
| 1 | 213INT4101 | Advanced Networks | TC | 4 |
| 2 | 213INT4102 | Agent Based Intelligent Systems | TC | 4 |
| 3 | 213INT3105 | Computational Linguistics | TC | 4 |
| 4 | 213INT1111 | E-Learning Techniques | TC | 4 |
| 5 | 213INT3106 | Heterogenous Computing | TC | 4 |
| 6 | 213INT3107 | Pattern Recognition | TC | 4 |
| 7 | 213INT4103 | Visualization Techniques | TC | 4 |

**CO-SO Mapping Correlation**

3 – High Correlation

2 – Medium Correlation

1 – Low Correlation

**PROGRAM CORE COURSES (52 Credits)**

212INT1401: WEB APPLICATION DEVELOPMENT

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **212INT1401** | **WEBAPPLICATIONDEVELOPMENT** | **2** | **0** | **2** | **3** | **4** | **7** |
| Pre-requisite: NIL<br>Course Category: Program Core<br>Course Type: Integrated Course with Practical | | | | | | | |

**COURSE OBJECTIVE(S):**

- To learn the theoretical and practical concepts of web programming.
- To introduce the programming languages for developing simple webapplications.
- To make students to understand about the architecture of web server anddeployment of web site
- To teach methodologies useful for the implementation of dynamic webapplications
- To efficiently design and implement web applications using server-side programming languages.

**COURSE OUTCOME(S):**

**CO1.** Apply frontend web development concepts in designing static pages.

**CO2.** Apply frontend web development concepts in deigning dynamic pages.

**CO3.** Develop web server incorporating multimedia features.

**CO4.** Develop dynamic server-based applications through ASP.

**CO5.** Apply database concepts in storing and managing data generated through web applications

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| **CO\SO** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | 3 |
| **CO2** | | 3 | 3 | | 3 | 3 |
| **CO3** | | | 3 | 3 | | 3 |
| **CO4** | 3 | | | | | |
| **CO5** | 2 | | | | | |

**COURSE TOPIC(S):**

**UNIT – I (Web Basics and HTML)**

History of Internet and W3C – Internet Protocols – HTTP Request and Response – HTTP Message Header Types – HTML (5): Basic Tags – Metadata Tags – Section Tags – Grouping Tags – Text Formatting Tags – Embedded Content Tags – Multimedia – Tables – Forms

**UNIT – II (Dynamic HTML, Client Scripting and CSS)**

JavaScript: History – Syntax – variables – data types – operators - control structures – functions – arrays - objects – events - ajax; CSS: Inline, Embedded and External style sheets – positioning elements – backgrounds – element dimensions – box model and flow model

**UNIT –III (Server Side Scripting using ASP.NET with .NET Framework)**

ASP.NET Introduction – Server Controls: HTML Server Controls - ASP.NET Web Controls – Validation controls – List – User Controls – State Management: Client Side state management - Server Side state management- ASP.NET Ajax Controls - URL Rewriting - Working with XML documents – IIS

**UNIT – IV (Accessing Database)**

ADO.NET – Connecting Database – Performing CURD operations with SqlCommand, SqlDataReader objects – Disconnected Database - Working with stored procedures – SQL Injection Attacks and prevention

**UNIT – V (Web Services and Security)**

Web Services: WSDL – SOAP – RDF – RSS – Web Security Issues: Broken Authentication and Session Management - Sensitive Data Exposure - XML External Entities (XXE) - Broken Access Control - Security Misconfiguration - Cross-Site Scripting XSS

**15 WEEK COURSE PLAN**

| Week | Lecture (2 Hours) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| Week 1 | History of Internet and W3C – Internet Protocols – HTTP Request and Response – HTTP Message Header Types | Familiarizing with Web Applications and Browsers – Web Portals, e-Commerce, Blogs, Social Media, etc. | Create a Profile Page in Google Sites:• Include Name and Public Personal Details• Include Photo• Include “About Yourself” section |
| Week 2 | HTML5: Basic Tags – Metadata Tags – Section Tags – Grouping Tags – Text Formatting Tags | Working with Basic HTML Tags | Add to Profile Page:• Expertise and Achievements• Strengths• Photo Gallery |
| Week 3 | Embedded Content Tags: Multimedia, Tables, Forms – Form Elements | Working with Tables and Forms | Add Specific Interests Section to Profile Page |
| Week 4 | JavaScript: History – Syntax – Variables – Data Types – Operators – Control Structures – Event Handling – Form Validation | Event Handling Examples:• Background Color Change• OnMouseOver Event | Create a Simple Game using JavaScript and CSS |
| Week 5 | Functions, Arrays, Objects, Events, AJAX | Demonstrate use of String, Math, and | — |

| Week | Lecture (2 Hours) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| | | Date Objects with Predefined Methods | |
| Week 6 | CSS: Inline, Embedded, and External Style Sheets – Positioning Elements – Backgrounds – Dimensions – Box Model – Flow Model | Apply CSS for Layout and Styling | Calendar Creation displaying all months |
| Week 7 | ASP.NET Introduction – Server Controls: HTML Server Controls, ASP.NET Web Controls, Validation Controls – List Controls – User Controls – IIS | Understanding .NET IDE for ASP Application Development | Installing and Configuring IIS; Create ASP.NET Application for Form Validation |
| Week 8 | State Management: Client-Side State Management – ASP.NET AJAX Controls | ASP.NET Application for State Management | Mini Project: Form Designing and Interface Creation |
| Week 9 | ASP.NET AJAX Controls – URL Rewriting – Working with XML Documents | ASP.NET Application with AJAX Controls | Extend Mini Project with AJAX Integration |
| Week 10 | ADO.NET: Database Connection – Performing CRUD Operations using SqlCommand and SqlDataReader Objects | Use ADO.NET for Database Connection with ASP.NET Application | Extend Mini Project to Connect with Database and Perform DB Operations |
| Week 11 | Disconnected Database using ADO.NET | Working with Disconnected Databases in ASP.NET | — |

| Week | Lecture (2 Hours) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| Week 12 | Working with Stored Procedures – SQL Injection Attacks and Prevention | Implement Stored Procedures in ASP.NET | Test Mini Project for SQL Injection and Apply Prevention Techniques |
| Week 13 | Web Services: WSDL – SOAP – RDF – RSS | Implement WSDL, SOAP, RDF, and RSS in ASP.NET | Case Study of WSDL, SOAP, RDF, and RSS on Different Platforms |
| Week 14 | Web Security Issues: Broken Authentication and Session Management – Sensitive Data Exposure – XML External Entities (XXE) | Add Security Measures for the Above Attacks | Test Mini Project for These Attacks and Implement Fixes |
| Week 15 | Advanced Web Security: Broken Access Control – Security Misconfiguration – Cross-Site Scripting (XSS) – Remote Code Execution (RCE) | Add Security Checks for XSS, RCE, etc. | Test Mini Project for These Attacks and Apply Solutions |

**TEXT BOOK**

1. Deitel & Deitel, Goldberg, “Internet and World Wide Web 5th Edition – How to Program”, Pearson Education Asia, 2012.

**REFERENCES**

1. Eric Ladd, Jim O’ Donnel, “Using HTML 4, XML and JAVA1.2”, Prentice Hall of India, QUE, 1999.
2. Aferganatel, “Web Programming: Desktop Management”, PHI, 2004.
3. Rajkamal, “Web Technology”, Tata McGraw-Hill, 2001.

212INT2301 DIGITAL LOGIC AND DESIGN

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **212INT2301** | **DIGITAL LOGIC AND DESIGN** | **L**<br>**3** | **T**<br>**0** | **P**<br>**2** | **X**<br>**0** | **C**<br>**4** | **H**<br>**5** |
| Prerequisite: Basic Electrical and Electronics Engineering<br>Course Category: Basic Engineering<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To understand different methods used for the simplification of BooleanFunctions.
- To design and implement combinational circuits.
- To design and implement synchronous and asynchronous sequentialcircuits.
- To study the fundamental of VHDL/ Verilog HDL.

**COURSE OUTCOMES:**

**CO1.** Able to design Logic gates with multi functionality implementation of Boolean functions

**CO2.** Write Program for combinational and sequential circuits like Multiplexers, Flip flops, Counters using VHDL language

**CO3.** Analyze and develop Synchronous Sequential circuits

**CO4.** Analyze and Design Asynchronous Sequential circuits

**CO5.** Design the specified logic (simple electronic circuits) with CMOS/Memoryand Implementation of Programming logics concepts

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| **CO\SO** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | |
| **CO2** | 3 | 3 | 3 | | | |
| **CO3** | | | 3 | | | |
| **CO4** | 3 | | | | | |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S):**

**UNIT I**

Binary Numbers-Boolean functions as sum if product and product of sum terms-Representation of Boolean function using Venn Diagram.

**UNIT II**

Introduction to combinational circuits-Developing boolean functions from given logicdiagram-Designing logic diagram from given design objective-Types of Combinational Circuits-WritingHardware Description Language for some combinational circuits.

**UNIT III**

Sequential Circuits-Analysis and design procedure-Flip Flops-Realization of one Flip Flop using other Flip Flops-Shift Registers & Counters-State Reduction & Assignment-HDL for with flipflops- Writing Hardware Description Language for some sequential circuits.

**UNIT IV**

Introduction to Asynchronous Circuit- Developing boolean functions from given logic diagram-Designing logic diagram from given design objective-Hazards.

**UNIT V**

Classification of Memory- Techniques used to detect and correct errors- Programmable Logic Devices-Types Sequential Logic Circuits- Realization of one flip flop over another-Introduction to circuits.

**LIST OF EXPERIMENTS**

1. Verification of Boolean expressions using digital logic gates
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters, etc.
3. Design and implementation of 4-bit binary adder / subtractor using basic gates and MSI devices.
4. Design and implementation of parity generator / checker using basic gates and MSI devices.
5. Design. and implementation of magnitude comparator
6. Design and implementation of application using multiplexers
7. Design and implementation of Flip-flops
8. Design and implementation of Shift registers

9. Design and implementation of Synchronous and Asynchronous counters
10. Coding combinational circuits using Hardware Description Language (HDL software required)
11. Coding sequential circuits using HDL (HDL software required) Additional Experiments:
12. Error Detection and Correction using Hamming Code.

**15 WEEK COURSE PLAN**

| **Week** | **Lecture (3 Hours)** | **Practical (2 Hours)** |
|---|---|---|
| Week 1 | What is signed binary number? - Representation of signed binary number | Realization of Boolean Expressions using Digital Logic Gates |
| Week 2 | Expressing boolean functions as sum of product and product of sum terms | |
| Week 3 | Representing boolean functions using ven diagram n | |
| Week 4 | Introduction to combinational circuits Developing boolean functions from given logic diagram. Designing logic diagram from given design objective. | Verification of truth table for combinational circuits |
| Week 5 | Types of Combinational Circuits | |
| Week 6 | Writing Hardware Description Language for some combinational circuits | HDL coding combinational circuits |
| Week 7 | Introduction to Sequential Circuits- Developing boolean functions from given logic diagram.<br>Designing logic diagram from given designobjective.<br>Reduction in states and assigning states. | Verification of truth table offlip flops and shift registers |

| | | |
|---|---|---|
| Week 8 | Realization of one flip flop over anotherIntroduction to circuits with flipflopsx | |
| Week 9 | Writing Hardware Description Language for some sequential circuits | HDL coding for Sequential Circuits |
| Week 10 | Introduction to Asynchronous Circuit | Verification of truth table for Synchronous Sequential circuits |
| Week 11 | Developing boolean functions from given logic diagram.<br>Designing logic diagram from given designobjective. | |
| Week 12 | Hazards | |
| Week 13 | Classification of Memory | Memory Decoding |
| Week 14 | Techniques used to detect and correct errors | Error detecting and correcting codes |
| Week 15 | Programmable Logic Devices-Types | Design of PLD |

**TEXT BOOK**

1. Morris Mano M, “Digital Design”, Pearson Education, 5th edition, 2013.

**REFERENCES**

1. Charles H.Roth, Jr., “Fundamentals of Logic Design”, Jaico Publishing House, 7th Edition, 2014.
2. Donald D.Givone, “Digital Principles and Design”, Tata McGraw-Hill, 2003

212INT2302 OPERATING SYSTEMS CONCEPTS

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **212INT2302** | **OPERATING SYSTEMS CONCEPTS** | **3** | **0** | **2** | **0** | **4** | **5** |
| Pre-requisite: Computer Organization and Assembly Language Programming(212INT1101)<br>Course Category: Program Core<br>Course Type: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn the mechanisms of OS to handle processes and threads and theirCommunication
- To learn the mechanisms involved in memory management incontemporary OS
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
- To know the components and management aspects of concurrencymanagement.

**COURSE OUTCOMES:**

**CO1.** Explain the fundamental concepts, structures, and services of operating systems, including UNIX and Windows environments.

**CO2.** Apply process management concepts such as scheduling, multithreading, and CPU scheduling algorithms to evaluate system performance.

**CO3.** Analyze process synchronization mechanisms and deadlock handling strategies to identify and resolve concurrency issues.

**CO4.** Evaluate memory and file management techniques, including paging, virtual memory, and access control models, for efficient resource utilization.

**CO5.** Design secure operating system configurations by integrating protection mechanisms, file system security practices, and OS-level security strategies.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 2 | | | | | 2 |
| **CO2** | 3 | 2 | | | | 2 |
| **CO3** | 3 | 2 | | | | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO4** | 3 | 3 | | | | 3 |
| **CO5** | 2 | 3 | 2 | 3 | 2 | 3 |

**COURSE TOPIC(S):**

**UNIT 1 : INTRODUCTION TO OPERATING SYSTEMS**

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System

**UNIT 2 : PROCESS SCHEDULING**

Processes: Definition, Process Relationship, Different States of a Process, Process State Transitions, Process Control Block (PCB), Operations on Processes - Cooperating Processes, Context Switching Thread: Definition, Various States, Benefits of Threads, Types of Threads, Concept of Multithreading - Process Scheduling: Foundation and Scheduling Objectives, Types of Schedulers, Scheduling Criteria (CPU Utilization, Throughput, Turnaround Time, Waiting Time, Response Time); Scheduling Algorithms: Pre-emptive and Non-preemptive (FCFS, SJF, RR); Multiprocessor Scheduling; Real-Time Scheduling: RM and EDF

**UNIT 3 : PROCESS SYNCHRONIZATION AND DEADLOCK**

Operations on Processes, Cooperating Processes , Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution - The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc. - Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

**UNIT 4 : MEMORY MANAGEMENT**

Memory Management: Basic concept–Internal and External fragmentation and Compaction; Paging, Virtual Memory Concepts - Page Replacement algorithms

**UNIT 5: FILE AND SECONDARY STORAGE MANAGEMENT**

Introduction: Session management and secure login, privilege levels and user roles, Access Control Models: Discretionary Access Control (DAC), Mandatory Access Control (MAC), Role-Based Access Control (RBAC); Protection Mechanisms: Access Matrix, Capabilities, and Access Control Lists (ACLs); File System Security: File permissions (UNIX & Windows), Encryption of files and directories; Memory Protection: Address space isolation, Stack protection; System Security: Intrusion detection and prevention at OS level, patch management and secure updates; Case studies: Security in LINUX/UNIX/Windows OS.

**LIST OF PRACTICAL COMPONENTS:**

1. Windows and UNIX Commands
2. Simulation of System calls
3. Implementation of CPU Scheduling algorithms
4. Simulation of IPC in UNIX
5. Implementation of deadlock avoidance algorithms
6. Implementation of Page replacement algorithms
7. Implementation of memory management functions
8. Implementation of disk scheduling algorithms

**15 WEEK COURSE PLAN**

| Week | Lecture (3 Hours) | Practical (2 Hours) |
|---|---|---|
| 1 | Introduction: Concept of Operating Systems, Generations of Operating Systems | Windows and UNIX Commands |
| 2 | Types of Operating Systems, OS Services, System Calls | — |
| 3 | Structure of an OS – Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case Study: UNIX and Windows Operating System | Simulation of System Calls |
| 4 | Processes: Definition, Process Relationship, Different States of a Process, Process State | Implementation of FCFS and SJF Scheduling Algorithms |

| | | |
|---|---|---|
| | Transitions, Process Control Block (PCB), Operations on Processes | |
| 5 | Cooperating Processes, Context Switching Thread: Definition, Various States, Benefits of Threads, Types of Threads, Concept of Multithreading | — |
| 6 | Process Scheduling: Foundation and Scheduling Objectives, Types of Schedulers, Scheduling Criteria (CPU Utilization, Throughput, Turnaround Time, Waiting Time, Response Time); Scheduling Algorithms: Pre-emptive and Non-preemptive (FCFS, SJF, RR); Multiprocessor Scheduling; Real-Time Scheduling: RM and EDF | Implementation of Round Robin and Priority Scheduling Algorithms |
| 7 | Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution | Simulation of IPC in UNIX |
| 8 | Synchronization: Producer-Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems – Readers-Writers, Dining Philosophers, etc. | Implementation of Readers-Writers Problem |
| 9 | Deadlocks: Definition, Necessary and Sufficient Conditions, Prevention, Avoidance (Banker's Algorithm), Detection and Recovery | Implementation of Deadlock Avoidance Algorithms |
| 10 | Memory Management: Basic Concepts, Logical and Physical Address Map, Memory Allocation – Contiguous (Fixed and Variable Partition), Internal and External Fragmentation, Compaction | Implementation of Memory Management Functions |
| 11 | Paging: Principle of Operation, Page Allocation, Hardware Support, Protection and Sharing, Disadvantages of Paging | Implementation of Page Replacement Algorithms |

| | | |
|---|---|---|
| 12 | Virtual Memory: Basics, Hardware and Control Structures, Locality of Reference, Page Fault, Working Set, Dirty Page/Bit, Demand Paging, Page Replacement Algorithms – Optimal, FIFO, Second Chance (SC), NRU, LRU | — |
| 13 | Memory Management: Basic concepts of memory allocation, internal and external fragmentation, compaction techniques; Paging: page tables, address translation; Virtual Memory Concepts: demand paging, page faults; Page Replacement Algorithms: FIFO, LRU, Optimal, and performance comparison. | Implementation of Page Replacement Algorithms with Real-Time Page Fault Analysis |
| 14 | Session management and secure login, privilege levels and user roles; Access Control Models: Discretionary Access Control (DAC), Mandatory Access Control (MAC), Role-Based Access Control (RBAC); Protection Mechanisms: Access Matrix, Capabilities, Access Control Lists (ACLs). | Implementation of Comprehensive Access Control System using DAC, MAC, and RBAC Models |
| 15 | File System Security: UNIX and Windows file permissions, file and directory encryption; Memory Protection: address space isolation, stack protection; System Security: intrusion detection and prevention at OS level, patch management and secure updates; Case Studies: Security features in Linux, UNIX and Windows operating systems. | Implementation of Secure File System with UNIX |

**TEXT BOOKS:**


1. Abraham Silberschatz, Peter Galvin, Greg Gagne, “Operating System Concepts andEssentials”, 9th Edition, Wiley Asia Student Edition.
2. William Stallings, “Operating Systems: Internals and Design Principles”, 5th Edition, Prentice Hall of India.


**REFERNCE BOOKS**

1. Charles Crowley, “Operating System: A Design-oriented Approach”, 1st Edition by Irwin Publishing.
2. Gary J. Nutt, “Operating Systems: A Modern Perspective”, 2nd Edition, Addison-Wesley.
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hallof India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

212INT2303: DATA STRUCTURES AND ALGORITHMS

| 212INT2303 | DATA STRUCTURES AND ALGORITHMS | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Pre-requisite: Python for Programming and Product Development (211CSE1401)<br>Course Category: Program Core<br>Course Type: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn the systematic way of solving problems.
- To understand the different methods of organizing large amounts of data.
- To introduce the practical and formal aspects of data structures
- To teach methodologies useful for the implementation and empirical evaluation of sorting and searching algorithms.
- To efficiently implement the solutions for specific problems using datastructures.

**COURSE OUTCOME(S):**

**CO1.** Implement different Linear Data structures in different applications

**CO2.** Design real time applications using general tree data structures an compare itscomplexity

**CO3.** Illustrate the various operations of hashing techniques and sorting algorithms,

**CO4.** Identify proper algorithms for problem optimizations

**CO5.** Implement the various algorithms - design techniques.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | | | 3 |
| CO2 | 3 | 3 | | | 2 | 3 |
| CO3 | | | | | | 3 |
| CO4 | 3 | | | | | |
| CO5 | 3 | | | | | |

**COURSE TOPIC(S):**

**UNIT 1: LINEAR STRUCTURES**

Abstract Data Types (ADT)-List ADT- Array based implementation- linked list implementation- Cursor based linked lists-Doubly linked lists- Applications of lists- stack ADT- Queue ADT- Circular queue implementation- Applications of stacks and queue.

**UNIT 2: TREE STRUCTURES**

Tree ADT- Tree Traversals Binary Tree ADT – Express trees Application of trees- binary search tree ADT- Threaded Binary Trees. AVL Trees – Splay Trees – B –Tree – heaps – Binary heaps – Applications of binary heaps

**UNIT 3: HASHING AND SORTING**

Hashing- Separate chaining – open addressing – rehashing – extendible hashing – Sorting – Insertion Sort – Selection Sort -Shell Sort – Heap Sort – Merge Sort – Quick Sort

**UNIT 4 : GRAPHS**

Graph Definitions and types, Graph Representation -topological sorting – breadth first traversal–shortest path algorithm – minimum spanning tree – Prims and Kruskal's algorithm– Depth first traversal- biconnectivity - Euler circuits – Applications of graphs

**UNIT 5: ALGORITHM DESIGN TECHNIQUES**

Introduction – Greedy Method- Divide and Conquer – Dynamic Programming- Back Tracking- Branch and Bound.

**LIST OF PRACTICAL COMPONENTS:**

1. Write a program to implement Stack Using Array and Linked list.
2. Write a program to implement Queue Using Array and Linked list.
3. Write a program to create a singly linked list.
4. Develop a date structure for trees, Include addition, deletion, access procedures. Apply this to problems like students list, passengers list, and polynomial representations.
5. Write a program to implement Binary Search Tree.
6. Write a program to implement Conversion of Infix Expression to Postfix Expression.
7. Write a program to implement Conversion of Postfix Expression to Infix Expression.
8. Write a program to implement Postfix Expression Evaluation.

9. Write an algorithm to convert a tree into a binary tree. Also traverse the tree.
10. Write a program to check for balanced parentheses of an expression using array implementation of stack.
11. Write a program to check for balanced parentheses of an expression using linked list implementation of stack.
12. Write a program to sort a set of elements using bubble sort, insertion sort, shell sort, heap sort, merge sort and quick sort.
13. Write a C program to implement the Dijkstra's Algorithm
14. Write C program for the implementation of minimum spanning using Kruskal Write C program for the implementation of minimum spanning using Prims algorithm.

**15 WEEK COURSE PLAN**

| **Week** | **Lecture (2 Hours)** | **Practical (2 Hours)** |
|---|---|---|
| 1 | Abstract Data Type (ADT): List ADT – Array-based implementation, Linked List implementation | Create a linear list using array and linked list |
| 2 | Cursor-based Linked List, Doubly Linked List, Applications of Lists, Stack ADT | Create a Doubly Linked List for polynomial representation. Write programs to implement Stack using array and pointers |
| 3 | Queue ADT: Circular Queue implementation, Applications of Stack and Queue | Write programs to implement Queue using array and pointers, create a singly linked list, perform postfix evaluation, and check for balanced parentheses using both array and pointer implementations of stack |
| 4 | Tree ADT: Tree traversals, Binary Tree ADT | Develop a data structure for trees including addition, deletion, and access operations. Apply this to examples like student lists, passenger lists, and polynomial representation |

| Week | Lecture (2 Hours) | Practical (2 Hours) |
|---|---|---|
| 5 | Expression Tree and Applications: Threaded Binary Tree, AVL Trees | Write a program to implement a Binary Search Tree |
| 6 | Advanced Trees: Splay Trees, B-Trees, Heaps, Binary Heaps, Applications of Heaps | Write an algorithm to convert a tree into a binary tree and perform traversal |
| 7 | Hashing: Separate Chaining, Open Addressing | Implementation of Separate Chaining |
| 8 | Rehashing and Extendible Hashing, Sorting: Insertion Sort | Write programs to sort a set of elements using Bubble Sort and Insertion Sort |
| 9 | Advanced Sorting: Selection Sort, Shell Sort, Heap Sort, Merge Sort, Quick Sort | Write programs to sort a set of elements using Shell Sort, Heap Sort, Merge Sort, and Quick Sort |
| 10 | Graph: Definitions and Types, Graph Representation, Topological Sorting | Implement Graph Representation and Topological Sorting |
| 11 | Graph Traversal: Breadth-First Search (BFS), Depth-First Search (DFS), Shortest Path Algorithms | Implement BFS, DFS, and Shortest Path Algorithms |
| 12 | Minimum Spanning Tree (MST): Prim's and Kruskal's Algorithms, Biconnectivity, Euler Circuits, Applications of Graphs | Implement MST using Prim's and Kruskal's Algorithms. |
| 13 | Introduction to Greedy Method: Knapsack Problem | — |

| Week | Lecture (2 Hours) | Practical (2 Hours) |
|---|---|---|
| 14 | Divide and Conquer, Dynamic Programming: Applications | Implement Tower of Hanoi, Dijkstra's Algorithm, and Huffman Encoding Techniques |
| 15 | Backtracking and Branch & Bound: Concepts and Applications | Implement the Eight Queens Problem |

**TEXT BOOK**

1. M.A.Weiss, "Data Structures and Algorithm Analysis in C", 4th Edition, Pearson Education, 2013.

**REFERENCES**

1. A.V.Aho, J.E.Hopcroft and J.D.Ullman, "Data Structures and Algorithms", Pearson Education, 2005.
2. R.F.Gilberg, B.A.Forouzan, "Data Structures", Second Edition, Thomson India Edition, 2005.

212INT2304: OBJECT ORIENTED PROGRAMMING USING JAVA

| 212INT2304 | OBJECT ORIENTED PROGRAMMING USING JAVA | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 | 5 |
| Pre-requisite: Python Programming (211CSE1402)<br>Course Category: Program Core<br>Course Type: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To understand the basic Java Programming skills and object- orientedprogramming concepts
- To know the working nature of Inheritances, Packages and Interfaces
- To examine the errors and to find the solution using ExceptionHandling and threads
- To apply the event handlers in the real time scenarios
- To develop applications using Graphical User Interfaces
- To aggregate the advanced Java skills of Swings

To develop web applications using Java Applets

**COURSE OUTCOME(S):**

**CO1.** Know the basic knowledge and programming skills of object oriented programming in Java

**CO2.** Apply the Inheritance, package and interface concepts of Java to develop the elevated applications

**CO3.** Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

**CO4.** Design event driven GUI and web related applications which mimic the real word scenarios.

**CO5.** Able to develop interactive programs using applets and swings

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | | 3 |
| **CO2** | 3 | 3 | | | | 3 |
| **CO3** | | | | | | 3 |
| **CO4** | 3 | 3 | | | | |
| **CO5** | 2 | 3 | | | | |

**COURSE TOPIC(S):**

**UNIT I: OOP Basics**

JAVA BASICS: Review of Object oriented concepts, History of Java, Java buzzwords, JVM architecture, Data types- Variables, Scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors- methods, Static block, Static Data, Static Method, String and String Buffer Classes, Using Java API Document.

**UNIT II: Inheritance, Packages and Interfaces**

Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading.- Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword. Defining package, Access protection, importing packages; Defining and Implementing interfaces, and Extending interfaces**.**

**UNIT III: Exception Handling, I/O and Multithreading**

Concepts of Exception Handling - Benefits of Exception Handling Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords- Built-in Exceptions, Creating own Exception classes, Input/Output: The I/O Classes and Interfaces, I/O Exceptions, Stream classes, Concepts of Thread, Thread life cycle- creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication

**UNIT IV: Event Handling**

Events: Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes; AWT: The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scroll pane, Dialogs, Menu bar, Graphics, Layout

Managers – Flow Layout, Border Layout, Grid Layout and Card Layout, Menu Bars and Menus.

**UNIT V: GUI Programming with Swing**

Swing: Introduction, Limitations of AWT, MVC Connection, Components and Containers, Exploring Swing: J Label and Image Icon, J Text Field, The Swing Buttons- J Button, J Toggle Button, Check Boxes and Radio Buttons, J Tapped Pane, J Scroll Pane, J List, J Combo Box, Trees and J Table. Introducing Swing Menus- Menu Basics, Overview of J Menu Bar, J Menu and J Menu Item, Create a Main Menu.

**LIST OF PRACTICAL COMPONENTS:**

1. Basic Java Programming
2. Programs using Objects and Classes
3. Programs using Array and String
4. Programs using Static data, Static block and Static Method
5. Programs using Inheritance
6. Programs using Interface
7. Programs using Exception Handling
8. Programs using Stream Classes
9. Programs using Multithreading
10. Programs using Event Handling
11. Programs using AWT
12. Programs using Swings and Swing Menus
13. Additional Experiments if any

**15 WEEK COURSE PLAN**

| **Course Chart: #Weeks** | **Lecture (3 Hours)** | **Pedagogy** | **Practical (2 Hours)** | **Pedagogy** |
|---|---|---|---|---|
| Week 1 | JAVA BASICS: Review of Object oriented concepts, History of Java, | Explicit Teaching | Disseminate with Java Compiler and OOPS | Study Experiment |
| | Java buzzwords, JVM architecture | Explicit Teaching | | |

| Course Chart: #Weeks | Lecture (3 Hours) | Pedagogy | Practical (2 Hours) | Pedagogy |
|---|---|---|---|---|
| | Data types- Variables, Scope and life time of variables | PPT | concepts | |
| Week 2 | Arrays and operators | PPT | Hands on session for Basic Java Programming | Demonstration |
| | Control statements | Explicit Teaching | | |
| | Type conversion and casting, simple java program | Explicit Teaching | | |
| Week 3 | Constructors- methods | PPT | Hands on session for Objects and Classes | Demonstration |
| | Static block, Static Data, Static Method | Explicit Teaching | | |
| | String and String Buffer Classes, Using Java API Document. | Explicit Teaching | | |
| Week 4 | Basic concepts, Types of inheritance | PPT | Hands on session for Array and String | Demonstration |
| | Member access rules | Explicit Teaching | | |
| | Usage of this and Super key word | | | |
| Week 5 | Method Overloading.- Method overriding, Abstract classes, | PPT | Hands on session for Static data, Static block and Static Method | Demonstration |
| | Dynamic method dispatch | Explicit Teaching | | |
| | Usage of final keyword. | PPT | | |
| Week 6 | Defining package, Access protection | PPT | Hands on session for Inheritance | Demonstration |
| | Importing packages | PPT | | |
| | Defining and Implementing interfaces, and Extending interfaces. | Explicit Teaching | | |
| Week 7 | Concepts of Exception Handling - Benefits of Exception Handling Exception types | Explicit Teaching | Hands on session for Interface | Demonstration |
| | Usage of Try, Catch, Throw, Throws and Finally keywords | Explicit Teaching | | |
| | Built-in Exceptions | PPT | | |
| Week 8 | Creating own Exception classes | PPT | | Demonstration |

| Course Chart: #Weeks | Lecture (3 Hours) | Pedagogy | Practical (2 Hours) | Pedagogy |
|---|---|---|---|---|
| | Input/Output: The I/O Classes and Interfaces | PPT | Hands on session for Exception Handling | |
| | I/O Exceptions, Stream classes | Explicit Teaching | | |
| Week 9 | Concepts of Thread, Thread life cycle | PPT | *Mid-semester practical examination-I* | |
| | creating threads using Thread class and Runnable interface | PPT | | |
| | Synchronization, Thread priorities, Inter Thread communication | Explicit Teaching | | |
| Week 10 | **Events:** Event Sources, Event Classes, | PPT | Hands on session for Stream Classes | Demonstration |
| | Event Listeners, Delegation Event Model, | PPT | | |
| | Handling Mouse and Keyboard Events, Adapter Classes | Explicit Teaching | | |
| Week 11 | **AWT:** The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas | PPT | Hands on session for Multithreading | Demonstration |
| | Scrollbars, Text Components, Check Box, Check Box Groups | Explicit Teaching | | |
| | Choices, Lists Panels – Scrollpane | Explicit Teaching | | |
| Week 12 | Dialogs, Menubar, Graphics, Layout Managers – Flow Layout, | PPT | Hands on session for Event Handling | Demonstration |
| | Border Layout, Grid Layout and Card Layout | PPT | | |
| | Menu Bars and Menus. | Explicit Teaching | | |
| Week 13 | **Swing:** Introduction, Limitations of AWT | PPT | Hands on session for AWT | Demonstration |
| | MVC Connection | PPT | | |
| | Components and Containers | PPT | | |

| Course Chart: #Weeks | Lecture (3 Hours) | Pedagogy | Practical (2 Hours) | Pedagogy |
|---|---|---|---|---|
| Week 14 | **Exploring Swing**: JLabel and ImageIcon, JTextField, The Swing Buttons- JButton, JToggleButton | Explicit Teaching | Hands on session for Swings and Swing Menus | Demonstration |
| | Check Boxes and Radio Buttons, JTappedPane, JScrollPane | PPT | | |
| | JList, JComboBox, Trees and JTable. | PPT | | |
| Week 15 | **Introducing Swing Menus**- Menu Basics | PPT | *Mid-semester practical examination-II* | |
| | Overview of JMenuBar, JMenu and JMenuItem | Explicit Teaching | | |
| | Create a Main Menu. | Explicit Teaching | | |

**TEXT BOOK**


1. Herbert Schildt, "The Complete Reference – Java", Tata McGraw-Hill Education, Eleventh Edition, 2019.
2. Paul J. Deitel, Harvey Deitel, "Java SE8 for Programmers", Deitel Developer Series, 3rd Edition, 2014
3. Y.Daniel Liang, "Introduction to Java programming – comprehensive version", Tenth Edition, Pearson Ltd 2015.
4. E.Balagurusamy. "Programming with JAVA A primer", Tata McGraw Hill Publication company, fourth edition, 2010


**REFERENCES**


1. Paul Deitel Harvey Deitel, Java - How to Program, Prentice Hall; 9th edition, 2011.
2. Cay Horstmann BIG JAVA,4th Edition, John Wiley Sons, 2009
3. Nicholas S.Williams, Professional Java for Web Applications, Wrox Press,2014
4. T. Budd (2009), An Introduction to Object Oriented Programming, Addison Wesley Longman, 2002

212INT2305: EMBEDDED SYSTEM TECHNOLOGY

| 212INT2305 | EMBEDDED SYSTEM TECHNOLOGY | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Pre-requisite: Digital Logic and Design(212INT2301)<br>Course Category: Program Core<br>Course Type: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To introduce the Significance and the role of embedded system forautomation.
- To understand the embedded system role in IOT and use it for application development.
- To observe the need for smart cities and systems
- To introduce the automotive embedded systems

To observe the evolving trend in communication based automotivesystems.

**COURSE OUTCOME(S):**

**CO1.** Ability to understand hardware and software requirements in embedded systems.

**CO2.** Ability to do develop data management through cloud interface with processor technology

**CO3.** Learn the development smart system solutions and analyse issues.

**CO4.** Ability to understand the types of sensors and Bus for control implementation.

**CO5.** Capacity to involve communication concepts for vehicle applicationdevelopment.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | | | |
| CO2 | 2 | 3 | 3 | | | 3 |
| CO3 | 3 | | 3 | | | |
| CO4 | 3 | | | | | |
| CO5 | 2 | 3 | | | | 2 |

**COURSE TOPIC(S):**

**UNIT I EMBEDDED SYSTEMS DESIGN**

Overview of Embedded system - Design process in embedded system- Communication ProtocolsEmbedded SOC- RTOS- Embedded product Development Life Cycle.

**UNIT II INTRODUCTION TO 8051 MICROCONTROLLER**

Introduction-8051 Architecture- Memory Organization- Internal RAM Structure- Stack Operation- Addressing Modes- Instruction Set- Assembler Directives; Assembly Language Programming Examples.

**UNIT III 8051 HARDWARE AND INTERFACE**

8051 Hardware- Introduction, Parallel ports, External Memory Interfacing- Program and Data Memory; Timers and Counters, Interrupts, Serial ports; 8051 Interface- Interfacing 8255 with 8051, 7-Segment display, Interfacing ADC and DAC, Interfacing Stepper Motor, Traffic Light Control.

**UNIT IV EMBEDDED SYSTEM FOR IOT**

Overview of IOT- Sensing- Actuation- IOT Networking- Communication protocols-data handling and analytics- cloud computing- Implementation of IOT with Raspberry pi- Industrial IOT.

**UNIT V EMBEDDED SYSTEMS AND IOT APPLICATIONS**

Embedded system for Smart Meter- smart Grid -Smart cities and smart homes, Agriculture and Healthcare, Energy auditing

**15 WEEK COURSE PLAN**

| Week | Lecture (3 Hour) | Practical (1 Hours) |
|---|---|---|
| Week 1 | Embedded systems, processor embedded intoa system, embedded hardware units and devicesin a system, embedded software in a system, examples of embedded systems | Installing of embedded software |
| Week 2 | embedded SOC and use of VLSI circuit design technology, Complex systems design and | Design an VLSI circuit in embeddedsoftware |

| | | |
|---|---|---|
| | processors, Design process in embeddedsystem | |
| Week 3 | Formalization of system design, design process and design examples, classification of embedded systems, skills required for an embedded system designer | Create a simple program Using Embedded software |
| Week 4 | Introduction-8051 Architecture- Memory Organization- Internal RAM Structure- Stack Operation | Create an simple ALP using PIC controller based on registers and memories |
| Week 5 | Addressing Modes- Instruction Set- Assembler Directives | Implement the interface programs based on parallelports and interrupts. |
| Week 6 | Assembly Language Programming Examples. | Create a memory based ALP using PIC. |
| Week 7 | 8051 Hardware- Introduction, Parallel ports,<br>External Memory Interfacing- Program andData Memory | Draw a simple IoT design in tinkercad. |
| Week 8 | Timers and Counters, Interrupts, Serial ports; 8051 Interface- Interfacing 8255 with 8051 | Implement these designs in tinkercad. |
| Week 9 | 7-Segment display, Interfacing ADC and DAC,Interfacing Stepper Motor, Traffic Light Control. | Implement these designs in tinkercad. |
| Week 10 | Functional Requirements - Components ofIoT:Sensors – Actuators - Embedded Computation Units – Communication Interfaces | Create a simple designs based on sensors and actuators in tinkercad. |
| Week 11 | Software Development. RFID – ZigBEE – Bluetooth – Internet Communication- IP Addresses - MAC Addresses | Create a Bluetooth and ZigBEEbaseddesign |
| Week 12 | TCP and UDP – IEEE 802 Family of Protocols – Cellular - Introduction to | |

| | | |
|---|---|---|
| | EtherCAT. | |
| Week 13 | Embedded system for Smart Meter | Implement the Embedded System |
| Week 14 | smart Grid -Smart cities and smart homes | Create a RFID based design and security attacks in Bluetooth |
| Week 15 | Agriculture and Healthcare, Energy auditing. | |

**TEXT BOOKS**:


1. Peckol, “Embedded system Design”, JohnWiley&Sons,2010
2. William B. Ribbens, Understanding Automotive Electronics, 6th edition, YES DEE Publishing Private Limited, 2011.
3. The Internet of Things: Enabling Technologies, Platforms, and Use Cases", byPethuru Raj and Anupama C. Raman (CRC Press), 1st Edition , 2017


**REFERENCES:**


1. Rajkamal, ‘Embedded system-Architecture, Programming, Design’, TMH,2011
2. Ronald k. Jurgen, Automotive Electronics Handbook, 2nd edition, McGraw-Hill,2007.
3. Mehrdad Ehsani, ‘Modern Electric, Hybrid Electric and Fuel cell vehicles’, CRCPress Second edition 2011

212INT3301 – DATA COMMUNICATION AND COMPUTER NETWORKS

| 212INT3301 | DATA COMMUNICATION AND COMPUTER NETWORKS | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 3 | 4 | 7 |
| Pre-requisite: Operating Systems Concepts (212INT2302)<br>Course Category: Program Core<br>Course Type: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To Provide a detailed introduction to the basic principles and techniques used in analog and digital communications.
- To know about analytical techniques to evaluate the performanceof communication systems
- To provide students with an overview of the concepts and fundamentals of data communication and computer networks

. **COURSE OUTCOME(S):**

**CO1** Inspect the basics of data communication and various categories of networks and its securities

**CO2** Identify the technologies for error free secure transmission of data in data link layer

**CO3** Apply various routing protocols to select optimal path and relate addressing entities in Network layer

**CO4** Analyze the various security protocols at different layers of OSI architecture

**CO5** Analyze the various protocols in application layer

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | | | 2 |
| **CO2** | | 3 | | 2 | | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO3** | 3 | 3 | | 2 | | 3 |
| **CO4** | 3 | | | | | 2 |
| **CO5** | 3 | 3 | 1 | 2 | | 3 |

**COURSE TOPIC(S) :**

**Unit I - Foundations of Data Communication and Network Architecture**

Introduction: Networks, Uses of Networks, Network Topology, Transmission Modes - Network Hardware. Transmission Technology - Categories of Networks - Network Software - Protocol Hierarchy - Design issues for the layers – Services. Reference Model: TCP/IP and OSI - Internet: Architecture of Internet - Physical Layer: Need and Issues, Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security. Data Communication, Guided transmission media, Wireless Transmission, Communication Satellites, Multiplexing and Switching.

**Unit II - Data Link Layer and Wireless Network Security**

DLL: Need and Issues - Error Detection and Correction - Protocol Verification and Data Link Layer protocols. MAC Sub layer - Channel Allocation Problem - Multiple Access Protocols – Ethernet - Wireless Network Security - Wireless Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security - Wireless LANs and VLAN - Data Link Layer Switching - Connectivity Devices - Configuration of Switches.

**Unit III - Network Layer Operations, Control, and Security Mechanisms**

Network Layer - Need and Issues - Routing algorithms., Network Access Control Extensible Authentication Protocol, IEEE 802.1X Port Based Network Access Control - Congestion Control Algorithms – QOS - Network Layer in Internet - Network Addressing - Configuration of Router - ARP and RARP

**Unit IV - Transport Layer and Secure Communication Protocols**

Transport Layer - Need and Issues - Transport Service - Elements of Transport Protocols - Simple Transport Protocol - TCP and UDP - Transport-Level Security - Secure Sockets Layer, Transport Layer Security, Secure Shell (SSH).

**Unit V - Application Layer Protocols and Principles of Security and Privacy**

Application Layer - Need and Issues – DNS - Electronic Mail – FTP – HTTP(WWW)- RPC – RMI - HTTPS, DHCP Security, Web Security - Secure Email (PGP, S/MIME) – Digital Certificates and Public Key Infrastructure (PKI) – Firewalls and Intrusion Detection Systems – Privacy Enhancing Technologies – Security and Privacy Best Practices in Networked Applications.

**LIST OF EXPERIMENTS:**

1. Study of Socket Programming
2. Socket Programming for Client-Server Communication
3. Configuration of Switch
4. Implementation of ARP
5. Implementation of RARP
6. Configuration of Router
7. Enable Client Server Communication using TCP Protocol
8. Implementation of Client Server communication using UDP Protocol
9. Implementation of FTP client
10. Download a File from HTTP Server
11. Implementation of Port Scanning

**15 WEEK COURSE PLAN**

| Week | Lecture (2 Hour) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| Week1 | Introduction: Networks, Uses of Networks, Network Topology, Transmis sion Modes - Network Hardware. Transmission technology - Categories of Networks | Study of different types of network cables | Impact of Networks in Day today life, Researching Converged Network Services. |

| Week | Lecture (2 Hour) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| Week2 | Network Software - Protocol Hierarchy - Design issues for the layers – Services. Reference Model: TCP/IP and OSI - Internet: Architecture of Internet - Physical Layer: Need and Issues, Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security. | Study of various networkingdevices | Packet Tracer - Help and Navigation, Network Representation, Exploring internetworking devices |
| Week3 | Data Communication, Guided transmission media, Wireless Transmission, Communication Satellites, Multiplexing and Switching. | Study of Basic Network commands and Network Configuration Commands | FTP Servers, |
| Week4 | DLL: Need and Issues - Error Detection and Correction - Protocol Verification and Data Link Layer protocols. MACSublayer - Channel Allocation | Checking Layer 2 functionality using packettracer | Web and Email, ExploringWireshark |

| Week | Lecture (2 Hour) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| | Problem - Multiple Access Protocols – Ethernet | | |
| Week5 | Wireless Network Security - Wireless Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security | Checking Layer 3 functionality using packettracer | DHCP |
| Week6 | Wireless LANs and VLAN - Data Link Layer Switching - Connectivity Devices -Configuration of Switches | Network Protocol analysis<br>a. Capture and Analyze TCP Segment.<br>b. Capture and Analyze UDP Datagram.<br>c. Capture and Analyze IP Packets | DNS Servers |
| Week7 | Network Layer - Need and Issues - Routing algorithms. Network Access Control, Extensible Authentic ation Protocol, IEEE 802.1X Port-Based Network Access control | Network Protocol analysis:<br>a. Capture and Analyze ICMP Packets.<br>b. Capture and Analyze ARP frame | Investigating the TCP/IP and OSI Models in Action |

| Week | Lecture (2 Hour) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| Week 8 | Congestion Control Algorithms – QOS - Network Layer in Internet | Domain Name Service | Configuring a Linksys router |
| Week 9 | Network Addressing - Configuration of Router - ARP and RARP. | HTTP download<br>Perform an experiment for port scanning with Nmap, Superscan or any other Software | Configure layer 3 switches |
| Week 10 | Transport Layer - Need and Issues - Transport service - | Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:<br>a. Caesar Cipher<br>b. Playfair Cipher<br>c. Hill Cipher<br>d. Vigenere Cipher | Identify MAC & IP Addresses, configure a small LAN |
| Week 11 | Elements of Transport Protocols - Simple Transport Protocol - TCP and UDP | | Managing the Medium, Examine the ARP Table, Configuring Secure Passwords and SSH |
| Week 12 | Transport-Level Security - Secure Sockets Layer, Transport Layer Security, Secure Shell (SSH). | Implement the following algorithms<br>a. DES<br>b. RSA Algorithm<br>c. Diffiee-Hellman<br>d. MD5<br>e. SHA-1 | Connecting a Wired and Wireless, |
| Week 13 | Application Layer - Need and Issues – DNS | | Scenario 1 |

| Week | Lecture (2 Hour) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| Week 14 | Electronic Mail – FTP – HTTP – WWW - RPC - RMI | Checking Layer 2 functionality using packet tracer. c) Configure Spanning Tree Protocol, d) Configure ARP and MAC Table. | Scenario 2 |
| Week 15 | HTTPS, DHCP Security, Web Security. | Checking Layer 2 functionality using packet tracer. a) Topologies - Ring Topology, Mesh Topology | Scenario 3 |

**TEXT BOOKS:**


1. Andrew S Tenenbaum, David J. Wetherall, "Computer Networks", Fifth Edition Pearson Education, 2011


**REFERENCE BOOKS:**


1. Behrouz A. Forouzan, "Data Communications and Networking", Fiftth Edition, McGraw-Hill, 2012
2. Larry Peterson, Bruce Davie, Morgan Kaufmann, "Computer Networks - A Systems Approach", Fifth Edition, 2011
3. Todd Lammle, "CCNA Cisco Certified Network Associate Study Guide", 7th Edition, 2011.
4. B. S. Manoj, C. Siva Ram Murthy , "Ad Hoc Wireless Networks Architectures andProtocols", Prentice Hall, 2004

212INT2306 INFORMATION STORAGE MODELINGAND RETRIEVAL

| 212INT2306 | INFORMATION STORAGE MODELING AND RETRIEVAL | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 3 | 4 | 7 |
| Prerequisite: Nil<br>Course Category: Program Core<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- Understand Storage Area Networks characteristics and components.
- Describe the challenges associated with data center networking and the need for switch network convergence.
- Storage Area Networks including storage architectures, logical and physical components of a storage infrastructure, managing and monitoringthe data center.
- Describe the business continuity and disaster recovery in a storage infrastructure.
- Describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
- Identify key areas to monitor in a data center for different components in a storage

**COURSE OUTCOMES:**

**CO1.** Understand Storage Area Networks characteristics and components.

**CO2.** Describe the challenges associated with data center networking and the need for switch network convergence.

**CO3.** Storage Area Networks including storage architectures, logical and physical components of a storage infrastructure, managing and monitoringthe data center.

**CO4.** Describe the business continuity and disaster recovery in a storage infrastructure.

**CO5.** Describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 3 | | | |
| **CO2** | 3 | | 3 | | | |
| **CO3** | 3 | | 3 | 3 | | 3 |
| **CO4** | 2 | | | | | 3 |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(s):**

**UNIT I – Introduction to Database Systems and Relational Foundations**

File Systems – Database Systems – Levels of Abstraction – Schema and Instances – Data Models – Relational Model: Structure of Relational Model - Schema-instance distinction – Keys – Relational Query Language – Relational Algebra - SQL – Data Definition Language (DDL) – Data Manipulation Language (DML)

**UNIT II – SQL Data Retrieval, Permissions, and Procedural Database Constructs**

Data Retrieval: Clauses (JOINS, SET Operators, Aggregate Functions, Subqueries) - Transaction Control – Data Control Language (DCL) – Integrity Constraints – Views – Sequences – Indexes – Synonyms - Functions and Procedures – Triggers

**UNIT III – Data Modeling, Functional Dependencies, and Normalization**

Entity-Relationship Model – Attributes – Keys – Design Issues – Functional Dependencies – Non-Loss Decomposition - First Normal Form – Second Normal Form – Third Normal Form - Dependency Preservation – Boyce/Codd Normal Form – Multi-Valued Dependencies – Fourth Normal Form – Join Dependencies – Fifth Normal Form

**UNIT IV – Physical Storage, Indexing, Hashing, and Query Optimization**

Physical Storage Media – RAID – File Organization – Organization of Records in Files - Indexing and Hashing – Ordered Indices – B+ Tree Index Files – Static Hashing – Dynamic Hashing - Query Processing Overview – Catalog Information for Cost Estimation – Query Optimization

**UNIT V – Transaction Management, Concurrency Control, and Recovery Techniques**

Transaction Concepts – Transaction Recovery – ACID Properties - Need for Concurrency Control – Schedule and Recoverability – Serializability and Schedules - Concurrency Control – Types of Locks – Deadlock Handling – Timestamp-based Concurrency Control – Recovery Techniques (Immediate Update, Deferred Update, Shadow Paging)

**15 WEEK COURSE PLAN**

| **Week** | **Lecture (2 Hours)** | **Practical (2 Hours)** | **X-Component (3 Hours)** |
|---|---|---|---|
| Week 1 | File Systems – Database Systems – Levels of Abstraction – Schema and Instances – Data Models – Relational Model: Structure of Relational Model | Study of different database models:1. Oracle DB2. MySQL / MongoDB3. MS Access4. MS SQL Server5. PostgreSQL | 1. Case Study on DB models2. Analyse a DB Design project and find its requirements |
| Week 2 | Schema-instance distinction – Keys – Relational Query Language – Relational Algebra | Create a relational structure for a database system | — |
| Week 3 | SQL – Data Definition Language (DDL) – Data Manipulation Language (DML) | Implement DDL commands with constraints (keys) to create/alter/drop tablesUse DML commands to operate on databases (INSERT/UPDATE/DELETE) | Use the DB Project requirements to create the database, |

| Week | Lecture (2 Hours) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| | | | respective tables, and keys |
| Week 4 | Data Retrieval: Clauses (JOINS, SET Operators, Aggregate Functions, Subqueries) | Use SQL retrieval commands:a. SELECTb. WHEREc. GROUP BYd. ORDER BYe. WITHf. Aggregate Functions | Use data retrieval and DCL commands to fetch data from the database project. |
| Week 5 | Transaction Control – Data Control Language (DCL) – Integrity Constraints – Views – Sequences – Indexes – Synonyms | Use DCL to grant and revoke permissions on tables and databases | |
| Week 6 | Functions and Procedures – Triggers | Implement stored procedures and functions | |
| Week 7 | Entity-Relationship Model – Attributes – Keys – Design Issues – Functional Dependencies – Non-Loss Decomposition | Create ER diagrams, analyse functional dependencies and decompositions | Create ER diagram for the Project |
| Week 8 | First Normal Form – Second Normal Form – Third Normal Form | Normalization case studies | Apply normalization on the DB Project |
| Week 9 | Dependency Preservation – Boyce/Codd Normal | Normalization case studies | |

| Week | Lecture (2 Hours) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| | Form – Multi-Valued Dependencies – Fourth Normal Form – Join Dependencies – Fifth Normal Form | | |
| Week 10 | Physical Storage Media – RAID – File Organization – Organization of Records in Files | Study recent RAID models provided by OS and DB | Use the DB project to apply indexing, hashing techniques, and analyse query execution speed. |
| Week 11 | Indexing and Hashing – Ordered Indices – B+ Tree Index Files – Static Hashing – Dynamic Hashing | Use index and hash with tables | |
| Week 12 | Query Processing Overview – Catalog Information for Cost Estimation – Query Optimization | Use catalog information with tables | |
| Week 13 | Transaction Concepts – Transaction Recovery – ACID Properties | Transaction management study | Analyse the DB for transaction management; use TCL to manage DML commands. |
| Week 14 | Need for Concurrency Control – Schedule and Recoverability – | Study TCL commands | |

| Week | Lecture (2 Hours) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| | Serializability and Schedules | | |
| Week 15 | Concurrency Control – Types of Locks – Deadlock Handling – Timestamp-based Concurrency Control – Recovery Techniques (Immediate Update, Deferred Update, Shadow Paging) | Handle DML through transaction control queries | |

**TEXT BOOKS**


1. Hadley Wickham and Garrett Grolemund, "R for Data Science", O'Reilly Media, 2017.
2. Norman Matloff, "The Art of R Programming", No Starch Press, 2011.
3. Garrett Grolemund, "Hands-On Programming with R", O'Reilly Media, 2014.


**REFERENCE BOOKS**


1. John Chambers, "Software for Data Analysis: Programming with R", Springer, 2008.
2. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley, Second Edition, 2018.
3. Paul Teetor, "R Cookbook", O'Reilly Media, Second Edition, 2019.

212INT2307: SOFTWARE CONSTRUCTION AND MANAGEMENT

| 212INT2307 | SOFTWARE CONSTRUCTION AND MANAGEMENT | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 | 5 |
| Prerequisite: Nil<br>Course Category: Program Core<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- This course helps to understand theories, methods, and technologies applied for professional software development.
- To learn how the requirements for the software project is extracted from customers.
- To learn how design and testing are carried out for a project and also how the software is budgeted.

**COURSE OUTCOMES:**

**CO1.** Analyze and identify an appropriate process model to develop a given project

**CO2.** Understand the importance of requirements engineering process

**CO3.** Understand the design concepts and different real time systems and translate requirements in to design document

**CO4.** Exhibit ethical responsibility and professionalism during the conception, execution, and delivery of software product

**CO5.** Understand how the project budget is estimated based on measures and metrics.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | 3 | 3 |
| **CO2** | 3 | 3 | 3 | | 3 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO3** | 3 | | 3 | 3 | 3 | 3 |
| **CO4** | | | 3 | 3 | | |
| **CO5** | 2 | | | | | |

**COURSE TOPIC(s):**

**UNIT – I: Introduction to Software Engineering & SDLC**

What is Software? How it is getting developed (Phases). Discussion on different Software Development Life Cycle (SDLC) models. Course Highlights. - Comparison of various life cycle models. How to justify the selection of a particular SDLC model for a given project. - Discussion on the most popular SDLC model currently used in the industry.

**UNIT – II: Requirements Engineering & Modeling**

How to gather/extract requirements from customers. - Steps involved in the Requirements Engineering process. - How to validate and manage requirements.

**UNIT – III: Software Design & Architecture**

What is the condition for best design? - How to choose the appropriate Architectural Style for a given project. - Discussion on some real-time system designs.

**UNIT – IV: Software Testing Strategies & Test Management**

Devising a strategy to test the developed software. - How a developer can test the software. -

How to perform System testing? and how to manage the different software versions?

manage the different software versions?

**UNIT – V: Project Management, Cost Estimation & Risk Management**

How software cost is performed? - How to make Risk Management Plan and Mitigation Plan. - How to speed up the software development process?

**15 WEEK COURSE PLAN**

| **Week** | **Lecture (3 Hours)** | **Practical (2 Hour)** |
|---|---|---|
| Week 1 | What is Software? How it is getting developed (Phases). Discussion on different Software | How to use Rational Rose software? Introduction to UML diagrams. |

| Week | Lecture (3 Hours) | Practical (2 Hour) |
|---|---|---|
| | Development Life Cycle (SDLC) models. Course Highlights. | |
| Week 2 | Comparison of various life cycle models. How to justify the selection of a particular SDLC model for a given project. | Problem discussion and preparation of SRS Document. |
| Week 3 | Discussion on the most popular SDLC model currently used in the industry. | Preparation of Project Plan based on SRS. |
| Week 4 | How to gather/extract requirements from customers. | Develop a Use Case Diagram for a project. |
| Week 5 | Steps involved in the Requirements Engineering process. | Develop an Entity Relationship (ER) Diagram for a project. |
| Week 6 | How to validate and manage requirements. | Develop a Data Flow Diagram (DFD) for a project. |
| Week 7 | What is the condition for best design? | Develop a Sequence Diagram for a project. |
| Week 8 | How to choose the appropriate Architectural Style for a given project. | Developing a software module based on design. |
| Week 9 | Discussion on some real-time system designs. | Writing Test Cases based on SRS. |
| Week 10 | Devising a strategy to test the developed software. | Test bed setup. Perform Smoke and Sanity Tests. |
| Week 11 | How a developer can test the software. | Executing the test cases. |
| Week 12 | How to perform System testing? and how to manage the different software versions? | Preparing a Bug Report. |
| Week 13 | How software cost is performed? | Debugging techniques. |
| Week 14 | How to make Risk Management Plan and Mitigation Plan. | Performing Regression Test and Retest. |
| Week 15 | How to speed up the software development process? | Project Demonstration. |

**TEXT BOOKS**


1. Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, seventh Edition,Mc-Graw Hill, 2014.

**REFERENCE BOOKS**


1. Steve McConnell, “Code Complete”, Second Edition, Microsoft Press.2004
2. Ian Somerville, “Software Engineering”, Addison-Wesley, Ninth edition, 2011.
3. Richard E. Fairley, “Software Engineering Concepts”, Second Edition McGraw- Hill, 1985.

212INT3302: DATA SCIENCE AND DATA VISULAIZATION

<table>
<tr><td rowspan="2">212INT3302</td><td rowspan="2">DATA SCIENCE AND DATA VISUALIZATION</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>3</td><td>4</td><td>7</td></tr>
<tr><td colspan="8">Prerequisite: Information Storage, Modelling and Retrieval (212INT2306)<br>Course Category: Program Core<br>CourseType: Integrated Course with Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

The student will be able to learn

- Students will develop relevant programming abilities.
- Students will develop the ability to build and assess data-basedmodels.
- Students will demonstrate skill in data management.
- Students will apply data science concepts and methods to solveproblems in real-world contexts and will communicate these solutions effectively

**COURSE OUTCOMES:**

**CO1.** Demonstrate proficiency with statistical analysis of data.

**CO2.** Develop the ability to build and assess data-based models.

**CO3.** Execute statistical analyses with professional statistical software.

**CO4.** Apply appropriate inferential statistical methods to analyze datasets and derive evidence-based conclusions

**CO5.** Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 3 | | | |
| **CO2** | | | | | | |
| **CO3** | 2 | 3 | 3 | | | |
| **CO4** | 3 | | | 3 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO5** | 3 | | | 3 | | 2 |

**COURSE TOPIC(S):**

**UNIT I: Introduction to Data Science and Data Handling**

Introduction to data collection and management – Data science process – Sources of data – Using R and Python tools – Working with APIs – Data exploration and preprocessing – Data storage and integration from multiple sources.

**UNIT II: Statistical Analysis**

Univariate statistics – Measures of location, dispersion, and shape – Covariance and correlation (Pearson, Kendall, Spearman) – Partial and multiple correlations – Covariance matrix – Statistical computing using R and Python (NumPy, SciPy, Pandas, linalg).

**UNIT III: Data Visualization with R**

Simple and multiple bar charts – Histograms – Boxplots – Density plots – Violin plots – Beeswarm plots – Scatter plots – Heatmaps – Drawing insights and interpreting data behavior using R.

**UNIT IV: Data Visualization with Python**

Visualization libraries in Python – matplotlib – seaborn – Implementing inferential statistics – Formulating hypotheses – Understanding p-values and confidence intervals – Introduction to significance testing.

**UNIT V: Advanced Visualizations and Applications**

Testing of significance – One-way ANOVA – Volumetric data visualization – Vector field visualization – Simulations – Geographic Information Systems (GIS) – Map visualization – Collaborative visualizations – Evaluating and refining data visuals.

**15 WEEK COURSE PLAN**

| Week | Lecture (2 Hours) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| Week 1 | Introduction to Data Collection and Management – Data Science Process – Sources of Data | Introduction to R Tool for Data Science | Introduction to R Tool for Data Science |
| Week 2 | Data Collection and APIs – Exploring and Fixing Data | Perform Data Exploration and Preprocessing in Python | Basics of R Programming |
| Week 3 | Data Storage and Management – Using Multiple Data Sources | Perform Data Analysis from multiple data sources | MapReduce Application for Word Counting on Hadoop Cluster |
| Week 4 | Univariate Statistics: Measures of Location, Dispersion, and Shape for Univariate Data Sets | Perform Univariate Statistics using R | K-Means Clustering using MapReduce in Hadoop |
| Week 5 | Multivariate Statistics: Covariance – Correlations (Pearson, Kendall, Spearman) – Partial and Multiple Correlations | Perform Multivariate Statistics using R | — |
| Week 6 | Using NumPy and SciPy Packages – Using Pandas and linalg Packages | Data Analysis using Python | Graph Analytics Use Cases |
| Week 7 | Visualization: Simple and Multiple Bar Charts, | Data Visualization using R | — |

| Week | Lecture (2 Hours) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| | Histograms, Boxplots, Density Plots, Violin Plots, Beeswarm Plots, Scatter Plots | | |
| Week 8 | Creating Heatmaps – Drawing Conclusions and Understanding Data Nature | Working with Heatmaps | Real-Time Analytics Platform |
| Week 9 | Python Packages for Data Visualization: Matplotlib, Seaborn, etc. | Working with Python Visualization Packages | — |
| Week 10 | Inferential Statistics: Testing Statistical Hypotheses – Formulation of Null and Alternative Hypotheses | Implementation of Inferential Statistics | Convert Unstructured Data into NoSQL Data and perform NoSQL Queries using APIs |
| Week 11 | Understanding the Significance of p-values – Confidence Intervals – Tests of Significance Related to Mean | — | — |
| Week 12 | One-Way ANOVA and Significance of Correlation – Confidence Intervals | Working on ANOVA Tool | Big Data for Blogs |
| Week 13 | Visualization of Volumetric Data, Vector | Data Visualization and Simulations | — |

| Week | Lecture (2 Hours) | Practical (2 Hours) | X-Component (3 Hours) |
|---|---|---|---|
| | Fields, Processes, and Simulations | | |
| Week 14 | Visualization of Maps, Geographic Information, and GIS Systems | Study of GIS Systems for Data Analysis | Recommendation Systems using Hadoop Libraries |
| Week 15 | Collaborative Visualizations – Evaluating Visualizations | Study of Collaborative Visualization Techniques | — |

**TEXT BOOKS**


1. Roger S. Pressman, “Software Engineering: A Practitioner’s Approach”, Seventh Edition, McGraw-Hill, 2014.
2. Ian Sommerville, “Software Engineering”, Tenth Edition, Addison-Wesley, 2015.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Second Edition, Addison-Wesley, 2005.


**REFERENCE BOOKS**


1. Stephen R. Schach, “Object-Oriented and Classical Software Engineering”, Eighth Edition, McGraw-Hill, 2010.
2. Frank Buschmann et al., “Pattern-Oriented Software Architecture”, Volume 1, Wiley, 2007.
3. Craig Larman, “Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development”, Third Edition, Prentice Hall, 2004.

212INT1101 - COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE PROGRAMMING

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **212INT1101** | **COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE PROGRAMMING** | **L**<br>**3** | **T**<br>**0** | **P**<br>**0** | **X**<br>**0** | **C**<br>**3** | **H**<br>**3** |
| Pre-requisite: Nil<br>Course Category: Program Core<br>Course Type: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To make acquainted the students about the functional units of computer and how each unit works along with the architectural and performance issues.

**COURSE OUTCOME(S):**

**CO1.** Explain the functional components of a computer, data transfer mechanisms, addressing modes, and basic assembly language input/output operations

**CO2.** Perform arithmetic operations on binary numbers using addition, subtraction, multiplication, and division methods for both signed and unsigned representations

**CO3.** Describe the instruction execution cycle using single-bus and multi-bus organization, pipelining concepts, and identify potential error types during data processing

**CO4.** Compare and evaluate different memory systems—including RAM, ROM, cache, and virtual memory—and analyze their performance characteristics.

**CO5.** Explain the working of input/output devices, memory access techniques such as DMA, and compare different I/O interfaces

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | |
| **CO2** | 3 | 3 | | | | |
| **CO3** | 3 | | | | | |
| **CO4** | | 3 | | | | 2 |
| **CO5** | 3 | | | | | 2 |

**COURSE TOPICS:**

**UNIT 1:**

Different Functional Parts of a computer, Operations of a computer, Data transferring between different parts-Storing the data into the Memory and its Locations, Methods of data brought into different Instructions and execution-Types of Addressing Modes, Assembly Language programming – Input and Output operations of data

**UNIT 2:**

Binary numbers Addition and Subtraction with different methods-Multiplication of Positive binaryNumbers using signed and unsigned numbers-Division methods using different binary Numbers

**UNIT 3:**

Fundamental Concepts of a computer organization, Execution of a Complete Instruction using Single Bus and Multiple Bus Organization- Data execution methods using the Pipelining Concept-How errors are happening during the process of data and its types.

**UNIT IV:**

Random Access Memory and Read Only Memory concepts and its comparison-Different Memory (Cache and Virtual) system and its Performance-Managing all the different memories, Data storing system of ROM.

**UNIT V:**

Input and Output devices and functions-Accessing the memory directly for fast process-Different Input Output Interfaces comparison.

**15 WEEK COURSE PLAN:**

| Week | Lecture (3 Hour) |
|---|---|
| Week 1 | Different Functional Parts of a computer, Operations of a computer, Data transferringbetween different parts |
| Week 2 | Storing the data into the Memory and its Locations, Methods of data brought into different Instructions and execution |
| Week 3 | Types of Addressing Modes, Assembly Language programming – Input and Output operations of data |
| Week 4 | Binary numbers Addition and Subtraction with different methods |
| Week 5 | Multiplication of Positive binary Numbers using signed and unsigned numbers |
| Week 6 | Division methods using different binary numbers |
| Week 7 | Fundamental Concepts of a computer organization, Execution of a Complete Instructionusing Single Bus and Multiple Bus Organization |
| Week 8 | Arranging of different units and Controlling methods, Data execution methods using thePipelining concept |
| Week 9 | How errors are happening during the process of data and its types |
| Week 10 | Random Access Memory and Read Only Memory concepts and its comparison |
| Week 11 | Different Memory (Cache and Virtual) system and its Performance |
| Week 12 | Managing all the different memories, Data storing system of ROM. |
| Week 13 | Input and Output devices and functions |
| Week 14 | Accessing the memory directly for fast process |
| Week 15 | Different Input Output Interfaces comparison |

**TEXT BOOK:**


1. Carl Hamacher, ZvonkoVranesic and SafwatZaky, Computer Organization, McGraw-Hill, 5th Edition 2012


**REFERENCE BOOKS:**


1. William Stallings, Computer Organization and Architecture – Designing for Performance,PHI pvt Ltd, 4th Edition, 2012.
2. David A.Patterson and John L.Hennessy, Computer Organization and Design: The hardware software interface, Morgan Kaufmann, 3rd Edition, , 2007.
3. John P.Hayes, Computer Architecture and Organization, McGraw Hill, 3rd Edition, 1998

212INT2101 DISCRETE MATHEMATICS

| 212INT2101 | DISCRETE MATHEMATICS | L<br>3 | T<br>1 | P<br>0 | X<br>0 | C<br>4 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Pre-requisite: Nil<br>Course Category: Program Core<br>Course Type: Theory | | | | | | | |

**COURSE OBJECTIVES:**

To enable the students to understand the concept of sets, relations, functions, logic and algebraic structure

**COURSE OUTCOME(S):**

**CO1.** Understand the concepts of Cartesian product, binary operation, partially order, relation, function and its properties.

**CO2.** Know about the pigeon-hole principle, inclusion and exclusion principles, tautology and normalforms.

**CO3.** Understand the concepts of lattice, homomorphism, modular and distributive lattices.

**CO4.** Understand the concepts of semigroup, group, Boolean algebra, Boolean ring and duality.

**CO5.** Understand the concepts in graph theory such as walk, cycle, path, trees, Hamiltonian and Euleriangraphs

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | | |
| **CO2** | 3 | 3 | | | 3 | 2 |
| **CO3** | | 1 | | | | |
| **CO4** | 3 | | | | 3 | 3 |
| **CO5** | 3 | 1 | | | | |

**COURSE TOPIC(s):**

**UNIT I – Relations, Functions, and Inclusion–Exclusion**

Principle of Inclusion and Exclusion – Operations on Relations – Composition of Relations – Types of Relations – Equivalence Relations and Equivalence Classes – Functions: One-to-One, Onto Functions – Composition of Functions – Inverse of a Function.

**UNIT II – Propositional Logic and Normal Forms**

Propositions – Logical Connectives – Tautology and Contradiction – Algebra of Propositions – Conditional and Bi-conditional Statements – Tautological Implications – Normal Forms – Disjunctive Normal Form (DNF) – Conjunctive Normal Form (CNF) – Principal DNF and Principal CNF.

**UNIT III – Counting and Recurrence Relations**

Permutations – Combinations – Recurrence Relations – Particular Solutions – Solving Recurrence Relations using Generating Functions.

**UNIT IV – Lattices and Boolean Algebra**

Lattices – Properties of Lattices – Lattices as Algebraic Systems – Sublattices – Boolean Algebra – Basic and Additional Properties of Boolean Algebra.

**UNIT V – Graph Theory and Trees**

Basic Definitions – Degree of a Vertex – Special Simple Graphs – Matrix Representation of Graphs – Paths, Cycles and Connectivity – Eulerian and Hamiltonian Graphs – Connectedness in Directed Graphs – Trees – Spanning Trees – Prim's Algorithm – Kruskal's Algorithm.

**15 WEEK COURSE PLAN**

| **Week** | **Lecture (3 Hour)** |
|---|---|
| Week1 | Principle of Inclusion-Exclusion, Some operations of relations |
| Week2 | Compositions of Relations, Types of Relations,Equivalence classes |
| Week3 | Functions – one-to-one – onto, Composition of functions–Inverse of a function. |
| Week4 | Propositions – Connectives, Tautology and contradiction |
| Week5 | Algebra of propositions, Conditional and bi-conditionalpropositions |

| | |
|---|---|
| Week6 | Tautological implications, Normal Forms, Disjunctive andconjunctive normal forms |
| Week 7 | Principal disjunctive normal forms, Principal conjunctive normal forms |
| Week8 | Permutations, Combinations |
| Week9 | Recurrence relations, Particular solutions, Solutions of recurrence relations using generating functions |
| Week 10 | Lattices, Properties of Lattices |
| Week 11 | Lattices as algebraic system, Sub lattices |
| Week 12 | Boolean algebra, Additional properties of Boolean algebra. |
| Week 13 | Basic definitions – Degree of a vertex – Some special simple graphs, Matrix representation of graphs |
| Week14 | paths, cycles and connectivity – Eulerian and Hamiltoniangraphs, Connectedness in directed graphs |
| Week15 | Trees – Spanning trees, Prim's algorithm – Kruskal'salgorithm. |

**TEXT BOOKS**

1. R. Kenneth Rosen, Discrete Mathematics and Its Applications, Seventh Edition, McGraw-Hill, 2012.
2. T. Veerarajan, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw-Hill, 2006.
3. T. Sundar Rajan, Discrete Mathematics, Tata McGraw-Hill, 2001.

**REFERENCE BOOKS**

1. Tremblay J.P. and Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill, 2001.
2. Seymour Lipschutz and Marc Lipson, Discrete Mathematics, Schaum's Outline Series, McGraw-Hill, 2017.
3. Kolman, Busby & Ross, Discrete Mathematical Structures, Sixth Edition, Pearson Education, 2009.

212INT2308 ARTIFICIAL INTELLIGENCE

| 212INT2308 | ARTIFICIAL INTELLIGENCE | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Structures and Algorithms (212INT2303)<br>Course Category: Program Core<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To understand the basic concepts in AI
- To understand various search techniques in problem solving
- To understand propositional logic, first logic and their applications
- To understand various learning techniques.

**COURSE OUTCOMES:**

**CO1.** Explain the foundation and history of Artificial Intelligence as well as science of Agent design.

**CO2.** Illustrate the use of problem-solving techniques such as the various search methods, games and constraint satisfaction problems.

**CO3.** Demonstrate AI's use of knowledge representation through logic agent and first order logic to address the AI problem.

**CO4.** Design simple software to experiment with various AI concepts and analyze results.

**CO5.** Analyze the various protocols in application layer

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | 3 | 3 |
| **CO2** | 3 | 3 | 3 | | 3 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO3** | | | 3 | | 3 | 3 |
| **CO4** | 3 | | | 3 | | |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT I**

Intelligent Agents – Agents and environments, Good behaviour, The nature of environments- The structure of agents. Problem Solving- problem solving agents, example problems, search forsolutions, uniformed search strategies.

**UNIT II**

Informed search and exploration–Informed search strategies, heuristic function–, local search algorithms and optimistic problems. Constraint satisfaction problems(CSP)- Backtracking search and Local search for CSP, The Structure of problems- Adversarial Search- Games, Optimal decisions in games , Alpha – Beta Pruning.

**UNIT III**

Logical Agents- Knowledge based agents, Propositional logic, Reasoning patterns in Propositional logic- First order logic–Syntax and semantics for first order logic- Using first order logic, Knowledge engineering in first order logic.

**UNIT IV**

Inference in First order logic– prepositional versus first order logic, unification and lifting- forward chaining–backward chaining – Resolution.- Ontological Engineering, Categories and Objects, Actions, Situations and Events.

**UNIT V**

Learning from observations-Forms of learning, Inductive learning, Learning decision trees, Ensemble learning, Knowledge in learning- Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming- Statistical learningmethods-Learningwithcompletedata-Learningwithhiddenvariable

**List of Experiments:**

1. Study of Prolog.
2. Write simple fact for the statements using PROLOG.
3. Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.
4. WAP to implement Factorial, Fibonacci of a given number.
5. Write a program to solve 4-Queen problem.
6. Write a program to solve 8 queens problem.
7. Write a program to solve traveling salesman problem.
8. Write a program to solve water jug problem using LISP.
9. Solve any problem using depth first search.
10. Solve any problem using best first search.
11. Solve 8-puzzle problem using best first search.
12. Solve Robot (traversal) problem using means End Analysis.

**15 WEEK COURSE PLAN**

| Week | Lecture (2 Hour) | Practical (2 Hour) |
|---|---|---|
| Week 1 | Intelligent Agents – Agents and environments, Good behaviour, The nature of environments | Study of Prolog. |
| Week 2 | The structure of agents. Problem Solving | Write simple fact for the statements using PROLOG. |
| Week 3 | problem solving agents, example problems, search for solutions, uniformed search strategies. | Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing. |
| Week 4 | Informed search and exploration – Informed search strategies, heuristic function –, local search algorithms and optimistic problems. Constraint satisfaction problems (CSP) | WAP to implement Factorial, Fibonacci of a given number. |

| Week | Lecture (2 Hour) | Practical (2 Hour) |
|---|---|---|
| Week 5 | Backtracking search and Local search for CSP, The Structure of Problems. | Write a program to solve 4-Queen problem. |
| Week 6 | Adversarial Search - Games , Optimal decisions in games , Alpha – Beta Pruning | Write a program to solve 8 queens problem. |
| Week 7 | Logical Agents-Knowledge based agents, Propositional logic, Reasoning patterns in Propositional logic | Mid Semester Practical – I |
| Week 8 | First order logic –Syntax and semantics for first order logic | Write a program to solve traveling salesman problem. |
| Week 9 | Using first order logic, Knowledge engineering in first order logic | Write a program to solve water jug problem using LISP. |
| Week 10 | Inference in First order logic – prepositional versus first order logic, unification and lifting | Solve any problem using depth first search. |
| Week 11 | forward chaining – backward chaining – Resolution. | Solve any problem using best first search. |
| Week 12 | Ontological Engineering, Categories and Objects, Actions, Situations and Events. | Solve 8-puzzle problem using best first search. |
| Week 13 | Learning from observations - Forms of learning, Inductive learning, Learning decision trees, Ensemble learning, Knowledge in learning | |
| Week 14 | Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming | Solve Robot (traversal) problem using means End Analysis. |
| Week 15 | Statistical learning methods - Learning with | Mid Semester Practical - II |

| Week | Lecture (2 Hour) | Practical (2 Hour) |
|---|---|---|
| | complete data - Learning with hidden variable | |

**TEXTBOOK**

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", $2^{nd}$ Edition, Pearson Education / Prentice Hall of India, 2004.

**REFERENCES**

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Richand Kevin Knight, "Artificial Intelligence", $2^{nd}$ Edition, Tata McGraw-Hill, 2003.
3. George F. Luger, "Artificial Intelligence – Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002.

212INT2102 – CYBER SECURITY AND FORENSICS

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **212INT2102** | **Cyber Security and Forensics** | **3** | **0** | **0** | **0** | **3** | **3** |
| Prerequisite: Nil<br>Course Category: Program Core<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- Understand key concepts and principles of cyber security and computer forensics.
- Learn how to ensure data confidentiality, integrity, and availability using appropriate security mechanisms.
- Analyze cyber threats, vulnerabilities, and forensic investigation processes.
- Gain hands-on familiarity with forensic tools and ethical evidence handling practices.
- Develop awareness of legal and professional responsibilities in cyber security and forensic investigations.

**COURSE OUTCOMES:**

**CO1.** Explain the fundamental concepts of cyber security, cybercrimes, and digital attacks.

**CO2.** Describe security policies, mechanisms, and forensic computation techniques for safeguarding information systems

**CO3.** Analyze cyber threats, attack patterns, and forensic investigation processes to identify security breaches

**CO4.** Apply forensic tools and proper evidence-handling methods to preserve, examine, and manage digital evidences.

**CO5.** Evaluate forensic findings, ethical issues, and emerging challenges in cyber security and digital investigations.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | 3 | |
| **CO2** | 3 | | | | | |
| **CO3** | | 2 | | | 3 | 3 |
| **CO4** | 2 | | | | | 3 |
| **CO5** | 3 | | | | | 3 |

**COURSE TOPIC(S):**

**UNIT I – Fundamentals of Cyber Security and Ethical Online Behavior**

Introduction to Cyber security – History and Evolution of the Internet – Cybercrimes and Information Security – Security Awareness – Web Browser Security – Email Security – Password Protection and Multi-Factor Authentication – Wi-Fi Security – Digital Privacy and Ethical Internet Usage – Data Protection Laws (IT Act 2000, Cyber Laws).

**UNIT II – System, Social Media, and Ethical Hacking Awareness**

Social Media Security – Safe Online Networking Practices – Windows and System Security – Trojans, Backdoors, Sniffers, and Key loggers – Honeypots – Ethical Hacking Concepts – Limits, Permissions, and Responsible Disclosure – Digital Manipulation Awareness – Ethical and Legal Issues in Monitoring and Surveillance.

**UNIT III – Mobile and Financial Security with Ethical and Privacy Safeguards**

Mobile and Smartphone Security – Android and iOS Security – Online and Mobile Banking Security – Debit/Credit Card and UPI Security – e-Wallet and POS Security – Micro ATM Security – Data Privacy in Financial Transactions – Ethical Handling of Financial Credentials – Compliance with Regulatory Standards (RBI Guidelines, GDPR Awareness).

**UNIT IV – Computer Forensics, Evidence Handling, and Ethical Responsibilities**

Overview of Computer Forensics – Use of Forensic Tools (EnCase, FTK, Autopsy) – Disk Imaging and Slack Space Review – Methods for Data Recovery and Retrieval – Steps in Processing Digital Evidence – Chain of Custody Procedures and Documentation – Ethical Practices for Evidence Collection and Preservation – Ensuring Confidentiality, Privacy, and Consent – Legal Standards and Reporting Requirements in Forensic Work.

**UNIT V – Mobile and Data Forensics with Ethical and Privacy Compliance**

Mobile Forensics – SIM Card Forensics – Imaging, Analysis, and Reporting – Faraday Bag Usage – Data Recovery from Digital Devices – Retrieval of Deleted, Renamed, and Compressed Files – Slack Space and Ghosting – Hashing and Data Validation Techniques – Ethical Use of Forensic Tools – Privacy, Professional Integrity, and Responsible Disclosure.

**15 WEEK COURSE PLAN**

| **Week** | **Lecture (3 Hours)** |
|---|---|
| Week 1 | Introduction to Cyber Security, evolution of the Internet, and understanding cybercrimes and information security. |
| Week 2 | Security awareness, safe browsing concepts, web browser security mechanisms, and email security with phishing and spoofing awareness. |
| Week 3 | Password hygiene, password managers, multi-factor authentication methods, and Wi-Fi security including WPA standards and risks. |
| Week 4 | Digital privacy, ethical online behavior, data protection laws including IT Act 2000, cyber laws, and practical case discussions. |
| Week 5 | Social media security, safe networking practices, digital manipulation awareness including fake profiles and deepfake issues. |
| Week 6 | Windows and system security fundamentals, introduction to Trojans, backdoors, sniffers, keyloggers, and understanding honeypots. |
| Week 7 | Ethical hacking concepts, scope and permission handling, responsible disclosure practices, and ethical issues in digital surveillance. |
| Week 8 | Mobile and smartphone security, Android and iOS security architecture, app permissions, and safe mobile usage. |
| Week 9 | Online and mobile banking security, debit/credit card and UPI safety, and security of e-wallets, POS devices, and micro ATMs. |
| Week 10 | Data privacy in financial transactions, ethical handling of financial credentials, and compliance requirements including RBI guidelines and GDPR basics. |

| Week | Lecture (3 Hours) |
|---|---|
| Week 11 | Introduction to computer forensics, forensic tools such as EnCase, FTK, and Autopsy, along with disk imaging and slack space analysis. |
| Week 12 | Digital evidence processing methods, chain of custody procedures, documentation standards, and ethical responsibilities in evidence preservation. |
| Week 13 | Mobile forensics basics, SIM card forensics, and procedures for mobile device imaging and analysis. |
| Week 14 | Data recovery techniques for deleted, renamed, and compressed files, slack space and ghosting concepts, and hashing and data validation techniques. |
| Week 15 | Ethical use of forensic tools, privacy and professional integrity practices, responsible disclosure, and overall revision of Units I to V. |

**TEXT BOOKS**


1. Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, seventh Edition, Mc- Graw Hill, 2014.


**REFERENCE BOOKS**


1. Bill Nelson, Amelia Phillips, Christopher Steuart, “Computer Security and Forensics,” Cengage Learning, 2015.
2. Marjie T. Britz, “Computer Forensics and Cyber Crime: An Introduction,” Pearson Education, 3rd Edition, 2018.
3. John R. Vacca, “Computer Forensics: Computer Crime Scene Investigation,” Charles River Media, 2nd Edition, 2012.

## PROGRAM ELECTIVE COURSES

213INT1101: AUGMENTED REALITY AND VRITUAL REALITY

| 213INT1101 | AUGMENTED REALITY AND VRITUAL REALITY | L<br>3 | T<br>0 | P<br>0 | X<br>0 | C<br>3 | H<br>3 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

Introduction to virtual reality, output/input devices, virtual reality APIs, 3Dinteraction techniques, modeling and simulation, experimental design and user
studies, effects of system fidelity, augmented reality, real-world applications ofvirtual reality

**COURSE OUTCOMES:**

**CO1.** Design, create, and integrate audio, visual, and interactive elements into a comprehensive immersive experience.

**CO2.** Develop content for successful delivery across multiple platforms, including PC, mobile devices and head-mounted displays.

**CO3.** Evaluate current trends of AR and VR media delivery to propose options to potential clients, and discuss the benefits, challenges and misconceptions involved
with working in AR and VR.

**CO4.** Evaluate various interaction schemes common to AR/VR experiences.

**C05.** Use immersive effects of visual and audio assets to AR/VR experiences andevaluate implementation methods.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | | | |
| **CO2** | | 3 | | 1 | | |
| **CO3** | 2 | | 3 | | | |
| **CO4** | | 2 | 1 | | 3 | |
| **CO5** | 3 | | | | 2 | 1 |

**COURSE TOPIC(S) :**

**UNIT 1 : INTRODUCTION**

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates

**UNIT 2: DEEP NETWORKS**

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks- Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning

**UNIT 3: DIMENTIONALITY REDUCTION**

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reductionin networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization

## UNIT 4: OPTIMIZATION AND GENERALIZATION

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization-Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

## UNIT 5: CASE STUDY AND APPLICATIONS

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec JointDetection-BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions

.

## REFERENCES:


1. CosmaRohillaShalizi, Advanced Data Analysis from an Elementary Point of View,
2. 2015.Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press, 2016.
4. Michael Nielsen, Neural Networks and Deep Lear,ning, Determination Press, 2015.

213INT1102: OBJECT ORIENTED ANALYSISAND DESIGN

| 213INT1102 | OBJECT ORIENTED ANALYSISAND DESIGN | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To know about OOAD method
- To know about software design steps

**COURSE OUTCOMES:**

**CO1.** Pointing out the importance and function of each UML model throughout the process of object-oriented analysis and design and explaining the notation of various elements in these models

**CO2.** Highlighting the importance of object-oriented analysis and design patterns

**CO3.** Providing students with the necessary knowledge and skills in using object-oriented CASE tools

**CO4.** Applying Design Patterns in software development process

**CO5.** Familiar with various coding and testing process

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | 3 | 3 |
| **CO2** | 3 | 3 | | | 3 | 3 |
| **CO3** | | | | | 3 | 3 |
| **CO4** | 3 | | | | | |
| **CO5** | | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1 : UML DIAGRAMS**

Introduction to OOAD – Unified Process - UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams

**UNIT 2 : DESIGN PATTERNS**

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling - High Cohesion – Controller - Design Patterns – creational - factory method - structural – Bridge - Adapter -behavioral – Strategy – observer

**UNIT 3 : CASE STUDY**

Case study – the Next Gen POS system, Inception -Use case Modeling - Relating Use cases – include, extend and generalization - Elaboration - Domain Models - Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies - Aggregation and Composition

**UNIT 4 : APPLYING DESIGN PATTERNS**

System sequence diagrams - Relationship between sequence diagrams and Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams - UML interaction diagrams - Applying GoF design patterns

**UNIT 5 : CODING AND TESTING**

Mapping design to code – Testing: Issues in OO Testing – Class Testing – OO Integration Testing – GUI Testing – OO System Testing

**TEXT BOOK**

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysisand Design and Iterative Development”, fourth Edition, Pearson Education, 2013.

**REFERENCES**


1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
2. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, "Design patterns:Elements of Reusable Object-Oriented Software", Addison-Wesley, 1995.
3. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object ModelingLanguage", Third edition, Addison Wesley, 2003.

213INT1103: ENTERPRISE RESOURCE PLANNING

| 213INT1103 | ENTERPRISE RESOURCE PLANNING | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 0 | 3 | 3 |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To know the basics of ERP
- To understand the key implementation issues of ERP
- To know the business modules of ERP
- To be aware of some popular products in the area of ERP
- To appreciate the current and future trends in ERP

**COURSE OUTCOMES:**

**CO1.** Understand basics and key implementation issues of ERP

**CO2.** Identify various roles of human resources in an Enterprise

**CO3.** Aware of ERP markets

**CO4.** Learn functional modules in an ERP package

**CO5.** Study current trends and predict future trends in ERP

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 3 | | | |
| **CO2** | | | 3 | | | |
| **CO3** | 3 | | 3 | 3 | | |
| **CO4** | 3 | | | 3 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1 : INTRODUCTION**

ERP: An Overview, Enterprise – An Overview, Benefits of ERP- ERP and Related Technologies-Business Process Reengineering (BPR)- Data Warehousing- Data Mining - OLAP - SCM **UNIT 2: ERP IMPLEMENTATION**

ERP Implementation Lifecycle - Implementation Methodology - Hidden Costs - Organizing the

Implementation – Vendors - Consultants and Users - Contracts with Vendors - Consultants and Employees - Project Management and Monitoring

**UNIT 3: THE BUSINESS MODULES**

Business modules in an ERP Package - Finance – Manufacturing (Production) - Human Resources - Plant Maintenance - Materials Management - Quality Management - Sales and Distribution

**UNIT 4: THE ERP MARKET**

ERP Market Place and Marketplace Dynamics - SAP AG - People soft – Baan - JD Edwards- Oracle corporation – QAD – SSA Global - Lawson software

**UNIT 5: ERP – PRESENT AND FUTURE**

Turbo Charge the ERP System – EIA - ERP and E-Business - ERP, Internet and WWW- ERPII - Future Directions and Trends in ERP.

**TEXT BOOK**

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill, New Delhi, 3$^{rd}$ edition 2014.

**REFERENCES**

1. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise ResourcePlanning", Thompson Course Technology, USA, 2001.
2. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning –Concepts and Practice", PHI, New Delhi, 2003.

213INT2308: SOFTWARE PROJECT MANAGEMENT

<table>
<tr><td rowspan="2">213INT2308</td><td rowspan="2">SOFTWARE PROJECT MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td colspan="8">Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- To develop an awareness of the need for project planning andmanagement.
- To know about software effort estimation and activity planning.
- To explore risk and people management.
- To learn about project monitoring and control mechanisms.
- To know about software quality management

**COURSE OUTCOMES:**

**CO1.** Differentiate between various software process models.

**CO2.** Prepare project planning documents.

**CO3.** Estimate the software cost for proj

**CO4.** Perform effective activity planning.

**CO5.** Prepare effective project scheduling work product.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| **CO\SO** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | 3 | 3 |
| **CO2** | | 3 | 1 | | 3 | 3 |
| **CO3** | 2 | | | 3 | | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO4** | 2 | | | 3 | | |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT I INTRODUC2TION**

Project – Software Projects versus Other Types of Project – Contract Management and Technical Project Management – Activities – Plans, Methods and Methodologies – Requirement Specification – Management Control – Overview of Project Planning – Introduction to Step WiseProject Planning–Programme Management and Project Evaluation.

**UNIT II SOFTWARE EFFORT ESTIMATION AND ACTIVITY PLANNING**

Software Effort Estimation: Problems with Over and Under Estimates – Basis of Software Estimating – Techniques – Expert Judgment – Cosmic Full Function Points – A Procedural Code Oriented Approach – COCOMO: A Parametric Model – Activity Planning: Objectives– Project Schedules – Projects and Activities – Sequencing and Scheduling Activities – Network Planning Models – Formulating A Network Model – Identifying Critical Path – Shortening the Project Duration – Identifying Critical Activities – Activity-on-arrow Networks.

**UNIT III SOFTWARE RISK AND PEOPLE MANAGEMENT**

Categories of Risk – Framework for Dealing with Risk – Risk Identification – Risk Assessment– Risk Planning – Risk Management – Evaluating Risks to the Schedule – Applying the PERT Technique – Monte Carlo Simulation – Critical Chain Concepts – Resource Allocation: Nature of Resources – Identifying Resource Requirements – Scheduling Resources – Creating Critical Paths – Counting the Cost – Cost Schedules – Scheduling Sequence.

**UNIT IV SOFTWARE PROJECT MONITORING AND CONTROL**

Creating the Framework – Collecting the Data: Partial Completion Reporting – Risk Reporting– Visualizing Progress: Gantt chart – Slip chart – Ball Charts – The Timeline –Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Getting the Project Back to Target – Change Control.

**UNIT V SOFTWARE QUALITY MANAGEMENT**

Managing Contracts: The ISO 12207 Approach, Supply Process, Types, Stages, Contract Management Managing People and Organizing Teams: Understanding Behaviour, Organizational Behaviour, Motivation, The Oldham– Hackman Job Characteristics Model, Decision Making, Leadership, Dispersed And Virtual Teams, Software Quality – Importance, Defining Software Quality, ISO 9126, Software Quality Measures, Product Versus Process Quality Management, External Standards, Quality Plans.

**TEXT BOOKS:**


1. Bob Hughes, Mike Cotterell, "Software Project Management", Fourth Edition, Tata McGraw-Hill, 2011.
2. Walker Royce, "Software Project Management: A Unified Framework", Pearson Education, 2004.


**REFERENCES:**


1. S. A. Kelkar, "Software Project Management: A Concise Study Paperback", Prentice Hall of India, 2013.
2. Ramesh Gopalaswamy, "Managing Global Software Projects", Tata McGraw Hill, 2001.
3. Humphrey Watts, "Managing the software process", Addison Wesley, 1989.
4. Ashfaque Ahmed, "Software Project Management Process Driven Approach", Auerbach Publications, 2011.

213INT1105: DIGITAL MARKETING

| 213INT1105 | DIGITAL MARKETING | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 0 | 3 | 3 |

Prerequisite: Nil

Course Category: Professional Electives

CourseType: Theory

**COURSE OBJECTIVES:**

- To introduce the students with the foundations of Digital Marketing
- To make the students understand the concept of SEO, Pay per Click, Google Analytics

**COURSE OUTCOMES:**

**CO1.** Understand Digital Marketing and Keywords, Hosting

**CO2.** Able to generate SEO and design email marketing and Mail Chimp

**CO3.** Able to build email signup forms, Adwords, Search and Design Campaigns

**CO4.** Analyse the behaviour of Traffic, preparing report and marketing

**CO5.** Apply the marketing techniques in Social Media Campaign

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 1 | | 1 | | | |
| **CO2** | | 3 | | 2 | | |
| **CO3** | 3 | | | | | 2 |
| **CO4** | 3 | | 2 | 3 | | |
| **CO5** | | 2 | | | 3 | |

**COURSE TOPIC(S) :**

**UNIT 1:** Introduction to Digital Marketing and its Significance -Traditional Marketing Vs Digital Marketing - Digital Marketing Process -Website Planning and Development : Types of websites - Website Planning and Development : Keywords - Understanding Domain and Webhosting - Building Website/Blog using CMS WordPress - Using WordPress Plug-ins

**UNIT 2: MINING DATA STREAMS**

Introduction to Search Engine Optimization - Keyword Planner Tools - On Page SEO Techniques-Indexing and Key Word Placement - On Page SEO Techniques-Content Optimization - On Page SEO : Yoast SEO Plug-in - Off –Page SEO Techniques - Email Marketing- Introduction and Significance - Designing e-mail marketing campaigns using Mail Chimp

**UNIT 3: HADOOP**

Building E-mail List and Signup Forms - Email Marketing Strategy and MonitoringEmail – Automization - Pay Per Click Advertising: Introduction - Pay Per Click Advertising: Google Adword - Type s of Bidding strategies - Designing and Monitoring search campaigns - Designin g and Monitoring Display campaigns

**UNIT 4: HADOOP ENVIRONMENT**

Designing and Monitoring Video campaigns - Designin g and Monitoring Universal App Campaigns - Google Analytics : Introduction and Significance - Google Analytics Interface and Setup - Understanding Goals and Conversions - Monitoring Traffic Behavior and preparing Reports - Social Media Marketing : Introduction and Significance - Facebook Marketing : Introduction Types of Various Ad Formats

**UNIT 5: FRAMEWORKS**

Setting up Facebook Advertising Account - Under standing Facebook Audience and its Types - Designing Facebook Advertising Campaigns - Working with Facebook Pixel

Twitter Marketing: Basics - Designing Twitter Advertising Campaigns - Introduction to LinkedIn Marketing - Developing digital marketing strategy in Integration form

**TEXT BOOKS**

1. Google Ad words for Beginners: A Do-It-Yourself Guide to PPC Advertising, By CoryRabazinsky, 2015
2. Digital Marketing for Dummies : By Ryan Deiss and Russ Hennesberry, 2017
3. Email Persuasion: **Captivate and Engage Your Audience, Build Authority and Generate More Sales With Email Marketing** By Ian Brodie, 2013
4. Social Media Marketing All-In-One for Dummies By Jan Zimmerman and Deborah Ng,2017

**REFERENCE BOOKS**

1. The Art of SEO, Eric Enge, Stephan Spencer, Jessie Stricchiola, 3rdEdition,O'ReillyMedia Inc
2. Digital Marketing 2020, Catch your business with Digital Marketing, Danny Star.

213INT1106: SIGNALS AND SYSTEMS

| 213INT1106 | SIGNALS AND SYSTEMS | L<br>3 | T<br>0 | P<br>0 | X<br>0 | C<br>3 | H<br>3 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To introduce the fundamental concepts of continuous-time and discrete-time signals and systems, along with their representations and classifications.
- To equip students with essential analysis techniques such as Z-Transform, Fourier-based transforms, DFT/FFT, and digital filter structures for understanding and processing signals.

**COURSE OUTCOMES:**

**CO1.** Identify different types of continuous time and discrete time signals.

**CO2.** Identify different types of continuous time and discrete time systems.

**CO3.** Analyze signals using Z Transform and FT.

**CO4.** Analyze signals using DFT and FFT.

**CO5** Appreciate different Digital Filter structures

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | |
| **CO2** | | 3 | 3 | | 3 | |
| **CO3** | | | 3 | | | |
| **CO4** | 3 | | | | | 2 |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1 : BASICS OF SIGNALS**

Basic operations on signals, continuous time and discrete time signals: step, impulse, ramp,exponential and sinusoidal functions

**UNIT 2: BASICS OF SYSTEMS**

Continuous time and discrete time systems, properties of systems: linearity, causality, time invariance, memory, stability, invertibility. Linear time invariant systems, convolution

**UNIT 3 : Z-TRANSFORM**

Z-transform, region of convergence, properties of Z-transform, inverse Z-transform.

**UNIT 4: FOURIER TRANSFORM**

Fourier transform (FT) of discrete time signals, properties of FT, relation between Z-transformand FT.

**Unit 5: DFT**

Discrete Fourier transform (DFT), Properties of DFT, inverse DFT, Fast Fourier transform (FFT), Radix-2 FFT algorithms, butterfly structure.

**Text Book(s):**


1. Tarun Kumar Rawat, "Signals and Systems", Oxford University Press, 2010.
2. V. Krishnaveni, A. Rajeswari, "Signals and Systems", Wiley, 2012


**Reference(s):**


1. Michael J Roberts and Govind Sharma, "Signals and Systems", McGraw Hill, 2010
2. M. N. Bandyopadhyaya, "Introduction to Signals and Systems and Digital Signal Processing",PHI, 2008

213INT1107: CYBER PHYSICAL SYSTEM

| 213INT1107 | CYBER PHYSICAL SYSTEM | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 0 | 3 | 3 |

Prerequisite: Nil

Course Category: Professional Electives

CourseType: Theory

**COURSE OBJECTIVES:**

- To understand the fundamentals of Computer Forensics and computing Investigations.
- To recognize the legal underpinnings and critical laws affecting forensics.
- To apply the tools and methods to uncover hidden information in digitalsystems.
- To learn about current licensing and certification requirements to build the career in digital forensic.

**COURSE OUTCOMES:**

**CO1.** Understand of the role of computer forensics

**CO2.** Identify some of the current techniques and tools

**CO3.** Describe and identify basic principles of good professional practice for a forensic computing practitioner

**CO4.** Demonstrate an understanding of issues related to privacy and determine how to address them technically and ethically.

**CO5** Apply some forensic tools in different situations.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | | 3 | | 3 | 3 |
| CO2 | 3 | | 3 | | 3 | 3 |
| CO3 | | | 3 | 3 | 3 | 3 |
| CO4 | 3 | | | | | |
| CO5 | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1: NTRODUCTION**

The Scope of Computer Forensics - Windows Operating and File Systems – HandlingComputer Hardware – Anatomy of Digital Investigation.

**UNIT 2: INVESTIGATIVE SMART PRACTICES**

Forensics Investigative Smart Practices – Time and Forensics – Incident closure

**UNIT 3: LAWS AND PRIVACY CONCERNS**

Laws Affecting Forensic Investigations – Search Warrants and Subpoenas – Legislated Privacy Concerns – The admissibility of Evidence – First Response and Digital Investigator

**UNIT 4: DATA ACQUISITION AND REPORT WRITING**

Data Acquisition – Finding Lost Files – Document Analysis – Case Management and ReportWriting – Building a Forensics Workstation

**UNIT 5: TOOLS AND CASE STUDIES**

Tools of the Digital Investigator - Licensing and Certification – Case Studies: E-mail Forensics-Web Forensics – Searching the Network – Excavating a Cloud – Mobile device Forensics.

**TEXTBOOKS:**

1. Michael Graves, "Digital Archaeology: The Art and Science of Digital Forensics",Addison-Wesley Professional, 2014.
2. Darren R. Hayes, "Practical Guide to Computer Forensics Investigation", Pearson, 2015.
3. Albert J. Marcella and Frederic Guillossou, "Cyber Forensics: From Data to DigitalEvidence " Wiley, 2015.

**REFERENCE:**

1. Bill Nelson, Amelia Phillips and Christopher Steuart, "Guide to Computer Forensics andInvestigations", Fourth Edition, Cengage Learning, 2013.

213INT1108**:** 5G NETWORKS

| 213INT1310 | 5G NETWORKS | L<br>3 | T<br>0 | P<br>0 | X<br>0 | C<br>3 | H<br>3 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- The enabling technologies of the 5G-EVE ICT-17 platform,
- The fundamental enablers of the Phase-2 5GPPP projects 5G-MoNArchand 5G-Xcast, and
- Novel machine learning functionalities developed within 5G-TOURS forthe operation of large-scale networks; the architecture will take into account security and privacy by design requirements.

**COURSE OUTCOMES:**

**CO1.** Understand the basic principles of wireless communication, networkconfiguration and virtualization beyond the 5G internet

**CO2.** Understand the small cells technology and co-operation for next generation networks.

**CO3.** Understand the basic architecture, deployment and their communication of 5G networks

**CO4.** Compare and explain various radio access technologies for 5G networks

**CO5** Describe and explain the evolution of 5G, system concepts and spectrum challenges

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | 3 |
| **CO2** | 3 | 3 | 3 | | | 3 |
| **CO3** | | | 3 | | 3 | 3 |
| **CO4** | 3 | | | | | |
| **CO5** | | | | | | |

**COURSE TOPIC(S) :**

**UNIT - I DRIVERS FOR 5G**

Introduction – Historical trend of wireless communication – Evolution of LTE Technology to Beyond 4G.THE 5G INTERNET – Internet of Things and context – Awareness – Network Reconfiguration and Virtualization support – Mobility – quality of Service Control – Emerging approach for resource over provisioning

**UNIT-II SMALL CELLS FOR 5G MOBILE NETWORKS**

Introduction – Small Cells – Capacity limits and Achievable gains with densification – Mobile data demand – Demand vs Capacity – small cell challenges. CO-OPERATION FOR NEXT GENERATION WIRELESS NETWORKS – Introduction – cooperative diversity and relaying strategies – PHY Layer Impact – MAC protocol analysis.

**UNIT – III 5G ARCHITECTURE**

Introduction – High level requirements for 5G architecture – Fundamentals architecture and 5G flexibility – Physical Architecture and 5G deployment. DEVICE TO DEVICE D2D COMMUNICATION – D2D: from 4G to 5G – Radio resource management for mobile brand D2D–Multihop D2D communications for proximity and emergency services – Multi-operator D2D communications.

**UNIT – IV THE 5G RADIO ACCESS METHODOLOGIES**

Access design principles for multiuser communications – Multicarrier with filtering; a waveform–Non – orthogonal schemes for efficient multiple access – Radio access for dense deployments–Radio access for V2x communication – Radio access for massive machine type communications.

**UNIT – V SPECTRUM**

Introduction – 5G spectrum landscape and requirements – Spectrum access modes and sharing scenarios.5G spectrum technologies – value of spectrum for 5G : a techno – economic perspectives THE 5G WIRELESS PROPAGATION CHANNEL MODE – Introduction – Modeling requirements and scenarios – the METIS channel models.

**REFERENCES**


1. Fundamentals of 5G mobile Networks, edited by Jonathan RodisQuez and Wiley
2. 5G Mobile and Wireless Communications TechnologybyAfifOsseiran(ed.) ; Jose F. Monserrat(ed.) ; Patrick Marsch(ed.) ; Mischa Dohler(other) ; Takehiro Nakamura(other) june 2016.
3. William Stallings, “Wireless Communication and Networks”, Pearson Education,2003.
4. Singhal, “WAP-Wireless Application Protocol”, Pearson Education, 2003.
5. LotherMerk, Martin.S.Nicklaus and Thomas Stober, “Principle of Mobile Computing”, Second Edition, Springer, 2003.
6. William C.Y.Lee, “Mobile Communication Design Fundamentals”, John Wiley,1993
7. Roy Blake, “Wireless Communication Technology”, India edition, Cengage learning. 2010.
8. UpenaDalal “Wireless Communication”,Oxford Higher education, First Edition, 2009.
9. Raj Kamal, “Mobile Computing”,Oxford Higher education, Second Edition, 2002.
10. J.Schiller, “Mobile Communication”, Addison Wesley, 2000.

213INT1109: EDGE COMPUTING

| 213INT1109 | EDGE COMPUTING | L<br>3 | T<br>0 | P<br>0 | X<br>0 | C<br>3 | H<br>3 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType:Theory | | | | | | | |

**COURSE OBJECTIVES:**

- This course comprehends the graphs as a modeling and analysis tool in computer science & Engineering. It introduces the structures such as graphs & trees and techniques of counting and combinations, which are needed in number theory based computing and network security studies in Computer Science.

**COURSE OUTCOMES:**

**CO1.** This course comprehends the graphs as a modeling and analysis tool in computer science & Engineering. It introduces the structures such as graphs & trees and

**CO2.** techniques of counting and combinations, which are needed in number theory based computing and network security studies in Computer Science.

**CO3.** This course comprehends the graphs as a modeling and analysis tool in computer science & Engineering. It introduces the structures such as graphs & trees and

**CO4.** techniques of counting and combinations, which are needed in number theory based computing and network security studies in Computer Science.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | |
| **CO2** | 3 | 3 | 3 | | 2 | |
| **CO3** | | | 3 | | | 3 |
| **CO4** | 3 | | | | 3 | |
| **CO5** | 2 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1**

Edge and Fog Computing – Foundations

Internet of Things (IoT) and New Computing Paradigms . Addressing the challenges in Federating Edge Resources- Integrating IoT + Fog + Cloud Infrastructures: System Modellingand Research Challenges- Management and Orchestration of Network slices in 5G, Fog, Edgeand Clouds . Optimization problems in Fog and Edge Computing

**UNIT 2**

Middleware

Middleware for Fog and Edge Computing: Design Issues . A Lightweight Container Middleware for Edge Cloud Architectures - Data Management in Fog Computing- Predictive analysis to develop to support Fog Application Deployment- Using Machine Learning (ML) for protecting the security and privacy of IoT Systems

**UNIT 3**

Applications

Fog Computing Realization for Big Data Analytics. Exploiting Fog Computing in Health Monitoring.- Smart Surveillance Video Stream Processing at the Edge for Real-Time Human Objects Tracking. Fog Computing Model for Evolving Smart Transportation Applications.

**UNIT 4**

Application Testing and Issues

Testing Perspectives of Fog-Based IoT Applications. Legal Aspects of Operating IoT Applications in the Fog.

**UNIT 5**

Model & Simulate Edge and Fog computing Model Fog and Edge Computing Environments Using network simulator toolkit (such as iFogSim, Ns3, OMNeT++, NetSim etc..,) - Simulate Fog and Edge Computing Environments Using network simulator Toolkit (such as iFogSim, Ns3, OMNeT++, NetSim etc..,)

**TEXT BOOK**


1. Satish Narayana Srirama, RajkumarBuyya,. (2019), , Fog and Edge Computing : Principles and Paradigms ,Wiley ,.
2. AbdulrahmanYarali,. (2018), , Cloud, Fog, and Edge: Technologies and Trends in Telecommunications Industry (Computer Science, Technology and Applications), Nova Science Pub Inc].


**REFERENCES**


1. Mahmood, Zaigham,. (2018), , Fog Computing Concepts, Frameworks and Technologies,Springer.
2. Rahmani, A., Liljeberg, P., Preden, J.-S., Jantsch, A.,. (2018), , Fog Computing in the Internet of Things Intelligence at the Edge,Springer.Liu C.L., Elements of Discrete Mathematics, McGraw Hill, 1985.
3. Rosen K.H., Discrete Mathematics And Its Applications, McGraw Hil, 2007

213INT1110: BIO INFOMATICS

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **213INT1110** | **BIO INFORMATICS** | **3** | **0** | **0** | **0** | **3** | **3** |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- Exposed to the need for Bioinformatics technologies
- Be familiar with the modeling techniques
- Learn microarray analysis
- Exposed to Pattern Matching and Visualization

**COURSE OUTCOMES:**

**CO1.** Learn the structural bioinformatics

**CO2.** Understand the concept of data warehousing and data mining in bioinformatics

**CO3.** Examine different models in bio informatics

**CO4.** Demonstrate the various patterns of DNA

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | |
| **CO2** | 2 | 3 | 2 | | | |
| **CO3** | 3 | | | | | 2 |
| **CO4** | 3 | | 1 | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

Need for Bioinformatics technologies – Overview of Bioinformatics technologies Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics - Biological Data Integration System.

**UNIT 2: DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS**

Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics.

**UNIT 3: MODELING FOR BIOINFORMATICS**

Hidden markov modeling for biological data analysis – Sequence identification –Sequence classification – multiple alignment generation – Comparative modeling –Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling.

**UNIT 4: PATTERN MATCHING AND VISUALIZATION**

Gene regulation – motif recognition – motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

**UNIT 5: MICROARRAY ANALYSIS**

Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding – spot extraction – normalization, filtering – cluster analysis – gene network analysis – Compared Evaluation of Scientific Data Management Systems–Cost Matrix – Evaluation model - Benchmark – Tradeoffs

**TEXT BOOK**

1. Yi-Ping Phoebe Chen (Ed), “BioInformatics Technologies”, First Indian Reprint, Springer Verlag, 2007.

## REFERENCES

1. Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education,2003.
2. Arthur M Lesk, “Introduction to Bioinformatics”, Second Edition, Oxford University Press, 2005.

213INT1301: INFORMATION CODING TECHNIQUES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **213INT1301** | **INFORMATION CODING TECHNIQUES** | **L**<br>**3** | **T**<br>**0** | **P**<br>**2** | **X**<br>**0** | **C**<br>4 | **H**<br>**5** |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To expose to students some concepts in information theory, and the performance characteristics of an ideal communications system.
- To expose to students fundamentals in coding and its applications.

**COURSE OUTCOMES:**

**CO1.** Explain basic information and channel capacity.

**CO2.** Understand different types of data and voice coding techniques

**CO3.** Explain and analyse source coding compression, decoding and error control methods as applied in communication system.

**CO4.** Analysis of various text and image compression techniques

**CO5.** Analysis of audio and video coding techniques

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| **CO\SO** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** |
|---|---|---|---|---|---|---|
| **CO1** | 2 | | 3 | | | |
| **CO2** | 3 | | 3 | | | |
| **CO3** | | | 3 | 3 | | 2 |
| **CO4** | 3 | | | | | 3 |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1 : INFORMATION ENTROPY FUNDAMENTALS**

Uncertainty- Information and Entropy – Source coding Theorem – Huffman coding – ShannonFano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.

**UNIT 2 : DATA AND VOICE CODING**

Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptivesub band coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal atlow bit rates (Vocoder, LPC).

**UNIT 3: ERROR CONTROL CODING**

Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.

**UNIT 4: COMPRESSION TECHNIQUES**

Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.

**UNIT 5: AUDIO AND VIDEO CODING**

Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video standards.

**TEXTBOOKS**


1. Simon Haykin & Michael Moher, "Communication Systems", John Wiley and Sons,5th Edition, 2009.
2. Fred Halsall, "Multimedia Communications, Applications Networks Protocols andStandards", Pearson Education, Asia 2002.


**REFERENCES**


1. Mark Nelson, "Data Compression Book", BPB Publication 2nd edition 1996.
2. Watkinson J, "Compression in Video and Audio", Focal Press, London, 1995.

213INT1302: DIGITAL IMAGE PROCESSING

| 213INT1302 | DIGITAL IMAGE PROCESSING | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To introduce the basic concepts and methodologies for analysis, modeling, synthesis and coding of speech and music and to provide a foundation fordeveloping applications and for further study in the field of digital audio standardsand its techniques

**COURSE OUTCOMES:**

**CO1.** Explain the basic concepts like sampling, image representation

**CO2.** Carry various transformations on images and restore them

**CO3.** Enhance the images using various filtering techniques for the region of interest

**CO4.** Apply various segmentation techniques on digital images

**CO5** Describe various representations of digital images

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | | |
| CO2 | 2 | | | 3 | | |
| CO3 | | | 1 | | | 1 |
| CO4 | 3 | 3 | | | | 2 |
| CO5 | | 3 | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1 : IMAGE PROCESSING FUNDAMENTALS**

Advantages, Applications, Limitations of DIP; Components of an image processing system, Digital image representation, light, hue, saturation and intensity, grey scale and colour images, colour models; Basic relationship between pixels, image sampling and quantization

**UNIT 2: IMAGE TRANSFORMS, IMAGE RESTORATION**

Two dimensional orthogonal transforms - DFT, FFT, Walsh, Slant, Hadamard, Haar transform, KLT, DCT, wavelets; Image degradation: Spatial domain, frequency domain; Degradation model for continuous function, continuous impulse function, restoration approaches: unconstrained restoration, constrained restoration, Lagrange multiplier, minimum mean square error filtering, constrained least square filtering, inverse filtering, removal of blur caused by uniform linear motion, Wiener filter, Geometric mean filter, Geometrical transformations

**UNIT 3: IMAGE ENHANCEMENT**

Image enhancement in the Spatial Domain, background, basic grey level transformations, histogram processing, enhancement using arithmetic/logic operations, basic of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods, image enhancement in the frequency domain -background, introduction to Fourier transform and frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, homomorphic filters, implementation

**UNIT 4 : IMAGE SEGMENTATION**

Detection of discontinuities, edge linking and boundary detection, threshold, region-based segmentation, segmentation by morphological watersheds, use of motion in segmentation

**UNIT 5: IMAGE REPRESENTATION**

Image representation, Boundary representation using chain codes, Polygonal approximation, signatures, skeleton, patters, recognition based on decision theoretic methods

**Text Book(s):**

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, 3rd Edition, 2013

**Reference(s):**


1. Anil. K. Jain, Fundamentals of Digital Image Processing, PHI, 2001
2. William K. Pratt, Digital image processing: PIKS Scientific Inside, Wiley, 4th Edition, 2012

213INT1303: PARALLEL AND DISTRIBUTED COMPUTING

| 213INT1303 | PARALLEL AND DISTRIBUTED COMPUTING | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 4 |

Prerequisite: Nil

Course Category: Professional Electives

CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

- To understand the need and fundamentals of parallel computingparadigms
- To learn the nuances of parallel algorithm design
- To understand the programming principles in parallel and distributedcomputing architectures
- To learn few problems that are solved using parallel algorithms

**COURSE OUTCOMES:**

**CO1.** Apply parallel and distributed computing architectures for any given problem

**CO2.** Apply problem solving (analysis, design, and development) skills to distributed applications

**CO3.** Develop applications by incorporating parallel and distributed computing architectures

**CO4.** Develop applications by incorporating fault tolerance

**CO5** Convert a sequential algorithm to a parallel one

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | 2 | | |
| **CO2** | 2 | 3 | | | 3 | 2 |
| **CO3** | 3 | | | | | |
| **CO4** | 3 | | 1 | 3 | | |
| **CO5** | 3 | | | | 2 | |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION TO PARALLEL COMPUTING**

Scope of Parallel Computing – Parallel Programming Platforms – Implicit Parallelism – Limitations of Memory System Performance – Control Structure of Parallel Platforms – Communication Model of Parallel Platforms – Physical Organization of Parallel Platforms – Communication Costs in Parallel Machines – Impact of Process - Processor Mapping and Mapping Techniques.

**UNIT 2: PARALLEL ALGORITHM DESIGN**

Preliminaries – Decomposition Techniques – Characteristics of Tasks and Interactions – Mapping Techniques for Load Balancing – Methods for Containing Interaction Overheads – Parallel Algorithm Models – Basic Communication Operations – One-to-All Broadcast and All- to-One Reduction – All-to-All Broadcast and Reduction – All-Reduce and Prefix Sum Operations – Scatter and Gather – All-to-All Personalized Communication- Circular Shift – Improving the Speed of some Communication Operations

**UNIT 3: PROGRAMMING USING MESSAGE PASSING AND SHARED ADDRESS SPACE**

Principles of Message Passing Programming – Building Blocks – Send and Receive Operations– MPI – Message Passing Interface – Topologies and Embedding – Overlapping Communication with Computation – Collective Communication and Computation Operations– Groups and Communicators – POSIX thread API – OpenMP: a Standard for Directive based Parallel Programming – Applications of Parallel Programming - Matrix-Matrix Multiplication– Solving Systems of Equations – Sorting Networks - Bubble Sort Variations – Parallel Depth First Search

**UNIT 4: DISTRIBUTED COMPUTING PARADIGM**

Paradigms for Distributed applications – Basic algorithms in Message passing Systems – Leader Election in Rings – Mutual Exclusion in Shared Memory.

**UNIT 5: FAULT TOLERANT DESIGN**

Synchronous Systems with Crash Failures – Byzantine Failures – Impossibility in Asynchronous Systems - Formal Model for Simulation – Broadcast and Multicast – Specification of a Broadcast Service – Implementing a Broadcast Service – Multicast in Groups

– Distributed Shared Memory – Linearizable – Sequentially Consistent Shared Memory – Algorithms

**TEXT BOOK**


1. AnanthGrama, Anshul Gupta, George Karypis and Vipin Kumar, ―Introduction to Parallel Computing‖, Second Edition, Pearson Education, 2009.
2. HaggitAttiya and Jennifer Welch, ―Distributed Computing – Fundamentals, Simulations and Advanced Topics‖, Second Edition, Wiley, 2012.


**REFERENCES**


1. Norman Matloff, ―Parallel Computing for Data Science – With Examples in R, C++ and CUDA‖, Chapman and Hall/CRC, 2015.
2. Wan Fokkink, ―Distributed Algorithms: An Intuitive Approach‖, MIT Press, 2013.
3. M.L. Liu, ―Distributed Computing – Principles and Applications‖, First Edition, Pearson Education, 2011.

213INT1304: STATISTICS USING R PROGRAMMING

| 213INT1304 | STATISTICS USING R PROGRAMMING | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

The student will be able to learn

- Use R for statistical programming, computation, graphics, andmodeling,
- Write functions and use R in an efficient way,
- Fit some basic types of statistical models
- Use R in their own research,
- Be able to expand their knowledge of R on their own.

**COURSE OUTCOMES:**

**CO1.** List motivation for learning a programming language

**CO2.** Access online resources for R and import new function packages into the R workspace

**CO3.** Import, review, manipulate and summarize data-sets in R

**CO4.** Explore data-sets to create testable hypotheses and identify appropriate statistical tests

**CO5.** Perform appropriate statistical tests using R Create and edit visualizations with

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | |
| **CO2** | 3 | 3 | | | | |
| **CO3** | 3 | 3 | | | | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO4** | 3 | 3 | | 3 | | |
| **CO5** | 3 | 3 | 3 | | | 3 |

**COURSE TOPIC(S) :**

**UNIT-I:**

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

**UNIT-II:**

R Programming Structures, Control Statements, Loops, - Looping Over NonvectorSets,- If-Else,

Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

**UNIT-III:**

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, SetOperation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files,

**UNIT-IV:**

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files, Probability Distributions, Normal Distribution-Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation andCovariance, T-Tests,-ANOVA.

**UNIT-V:**

Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis,Nonlinear Models, Splines- Decision- Random Forests,

**TEXT BOOKS:**

1. The Art of R Programming, A K Verma, Cengage Learning.
2. R for Everyone, Lander, Pearson
3. The Art of R Programming, Norman Matloff, No starch Press.

**REFERENCE BOOKS:**

1. R Cookbook, Paul Teetor, Oreilly.
2. R in Action, Rob Kabacoff, Manning

213INT1305 : DATA WAREHOUSINGAND MINING

| 213INT1305 | DATA WAREHOUSINGAND MINING | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To know the concepts and techniques of data mining and datawarehousing
- To understand the systems for data warehousing and/or data mining

**COURSE OUTCOMES:**

**CO1.** Learn concepts in Data Warehouses and implementation of architectures

**CO2.** Learn data preprocessing, language, architectures, concept description

**CO3.** Learn to use Association Rule Mining

**CO4.** Learn Classification And Clustering Techniques

**CO5.** Learn Recent Trends .in Data Mining

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | 3 | 3 |
| **CO2** | 3 | 3 | | | | 3 |
| **CO3** | | | 3 | | 3 | 3 |
| **CO4** | 3 | | | | 3 | |
| **CO5** | | | | 3 | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION TO DATA WAREHOUSING**

Introduction - Data Warehouse - Multidimensional Data Model - Data Warehouse Architecture

– Implementation - Further Development - Data Warehousing to Data Mining. Practical: Data Model

**UNIT 2: DATA PREPROCESSING, LANGUAGE, ARCHITECTURES, CONCEPT DESCRIPTION**

Why Pre processing - Cleaning, Integration – Transformation – Reduction – Discretization - Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces – Architectures - Concept Description - Data Generalization - Characterizations - ClassComparisons - Descriptive Statistical Measures. Practical: Query Language

**UNIT 3: ASSOCIATION RULES**

Association Rule Mining - Single-Dimensional Boolean Association Rules from Transactional Databases - Multi-Level Association Rules from Transaction Databases. Practical: Association Rules

**UNIT 4: CLASSIFICATION AND CLUSTERING**

Classification and Prediction – Issues - Decision Tree Induction - Bayesian Classification - Association Rule Based - Other Classification Methods – Prediction - Classifier Accuracy - Cluster Analysis - Types of data - Categorization of methods - Partitioning methods - Outlier Analysis. Practical: Categorization of methods

**UNIT 5 : RECENT TRENDS**

Multidimensional Analysis and Descriptive Mining of Complex Data Objects -Spatial Databases-Multimedia Databases - Time Series and Sequence Data - Text Databases – relationless databases- World Wide Web -Applications and Trends in Data Mining. Practical: Spatial Databases - Multimedia Databases

**TEXT BOOK**

1. J. Han, M. Kamber, “Data Mining: Concepts and Techniques”, Harcourt India Morgan Kauffman, 2011.

**REFERENCES**


1. Margaret H.Dunham, “Data Mining: Introductory and Advanced Topics”, PearsonEducation 2006.
2. Sam Anahory, Dennis Murry, “Data Warehousing in the real world”, Pearson Education 2009.
3. David Hand, Heikki Manila, Padhraic Symth, “Principles of Data Mining”, PHI 2004.

213INT1306 : BIG DATA ANALYTICS

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **213INT1306** | **BIG DATA ANALYTICS** | **3** | **0** | **2** | **0** | **4** | **5** |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To provide the students with a fundamental Of Big Data Analytics
- To acquire skills various Data Analytics.
- To introduce Data Mining Stream concepts.
- To familiarize the students with Clustering and Framework concepts

**COURSE OUTCOMES:**

**CO1.** Understand the Big Data Platform and Modern data analytic Tools

**CO2.** Learn neural networks, Fuzzy logic and data analytic concepts

**CO3.** Learn Data Mining rules to implement and Analysis

**CO4.** Understand types of clustering

**CO5.** Understand and implement the data analytic tools-Map reduce and Hadoop

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 2 | | 3 | | | |
| **CO2** | | | 3 | | | 23 |
| **CO3** | 3 | | 3 | 3 | | |
| **CO4** | 2 | | | | | |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION TO BIG DATA**

Introduction to Big Data Platform – Challenges of conventional systems - Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error. Practical: Hadoop Map Reduce job flow

**UNIT 2 : DATA ANALYSIS**

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics - Rule induction - Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods. Practical: Creating and customizing applications to analyze data

**UNIT 3 : MINING DATA STREAMS**

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window - Realtime AnalyticsPlatform(RTAP) applications - case studies - real time sentiment analysis, stock market predictions. Practical: Implementing a targeted Big Data strategy

**UNIT 4 : FREQUENT ITEMSETS AND CLUSTERING**

Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – CLIQUEand PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space

– Clustering for streams and Parallelism. Practical: Apply different classification techniques to classify the given data set

**UNIT 5 : FRAMEWORKS AND VISUALIZATION**

MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications. Practical: Apply various association rule mining algorithms

**TEXT BOOKS**

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”,Cambridge University Press, 2nd edition, 2012.

**REFERENCES**

1. Bill Franks, T”aming the Big Data Tidal Wave: Finding Opportunities in Huge DataStreams with advanced analystics”, John Wiley & sons, 2012.
2. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007 Pete Warden, BigData Glossary, O‟Reilly, 2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, SecondEdition, Elsevier, Reprinted 2008.

213INT1307 : FULL STACK SOFTWARE DEVELOPMENT

| 213INT1307 | FULL STACK SOFTWARE DEVELOPMENT | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 5 |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To get an overview of the full stack software and web development.
- To understand the object oriented structure and user interface programming through Python.
- To gain knowledge of web development using Flask Framework.
- To learn the web application deployment in real time scenarios.
- Tolearn to deploy the software in Linux and Windows platforms.

**COURSE OUTCOMES:**

**CO1.** Understand the object oriented approach in Python.

**CO2.** Develop GUI applications with Python.

**CO3.** Develop GUI applications with Python.

**CO4.** Package the developed code in Linux and Windows environment.

**CO5.** Deploy the developed web application using Flask in real time scenarios such as AWS.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | 3 | 3 |
| **CO2** | 3 | 3 | 3 | | 3 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO3** | | | 3 | 3 | 3 | 3 |
| **CO4** | 33 | | | | | |
| **CO5** | | | | | | |

**UNIT I OBJECT ORIENTED APPROACH IN PYTHON**

Classes – Class Coding Basics: Instances – Behavior Methods – Operator Overloading – Customizing Behavior Methods – Constructors – Polymorphism – Inheritance.

**UNIT II USER INTERFACE APPLICATIONS IN PYTHON AND VERSIONCONTROLSYSTEM**

Wxpython installation – Menus and Toolbars – Layout Management – Wxpython Events – Wxpython Dialogs – Widgets – Graphics – Collaborative Version Control Systems – Git Commands – Real Time Usage of Git Commands.

**UNIT III FLASK FRAMEWORK FOR WEB DEVELOPMENT**

Flask Basics – Routes – Templates – Control Flow – Inheritance – Forms – Modules – Connection with Databases – Relational Database versus NoSQL – Modeling – Mapping Classes to Mongo db–Building Data Layer with Mongo Engine.

**UNIT IV REAL TIME DEPLOYMENT OF WEB APPLICATION**

Deploy Web Applications with Flask and MongoDB – Example Applications – Blogs – Forums

–Auto Evaluation of Student Assignments – Deployment Using AWS or Google Cloud or Heroku.

**UNIT V DEPLOYMENT OF SOFTWARE IN LINUX AND WINDOWS PLATFORM**

Deployment in Ubuntu Distribution – Creation of .Deb Executable File – Deployment in Windows – Creation of Standalone Executable – Test Cases.

**TEXT BOOKS:**


1. Mark Lutz, "Learning Python", Fifth Edition, O' Reilly 2013.
2. http://zetcode.com/wxpython/
3. Scott Chacon and Ben Straub, "Pro Git", Free e-book under Creative commons,Second Edition, Apress, 2016.

4. Miguel Grinberg, “Flask Web Development Developing Web Applications with Python”, OReilly, 2014.

**REFERENCES:**


1. Karl Seguin, “The Little Mongo DB Book”, https://github.com/karlseguin/the-littlemongodb-book.
2. Gareth Dwyer, “Flask by Example”, Packt Publishers, 2016.
3. https://aws.amazon.com/education/awseducate/
4. http://packaging.ubuntu.com/html/packaging-new-software.html
5. http://www.pyinstaller.org/
6. https://pypi.org/project/py2exe/0.9.2.0/

213INT1308: PRINCIPLES OF DIGITAL SIGNAL PROCESSING

| 213INT1308 | PRINCIPLES OF DIGITAL SIGNAL PROCESSING | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 | 5 |

Prerequisite: Nil

Course Category: Professional Electives

CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

- The basic concepts and techniques for processing signals on a computer.
- Signals, systems, time and frequency domain concepts which are associatedwith the mathematical tools (i.e.) fundamental to all DSP techniques.
- To provide a thorough understanding and working knowledge of design, implementation, analysis and comparison of digital filters for processing of discrete time signals.
- To study various sampling techniques and different types of filters and will also understand Basic principles of Estimation Theory.
- The most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.

**COURSE OUTCOMES:**

**CO1.** Analyze and process signals in the discrete domain

**CO2.** Analyze signals using fast fourier transform

**CO3.** Design IIR Filters to suit specific requirements for specific applications

**CO4.** Design FIR Filters to suit specific requirements for specific applications

**CO5** Design and develop applications of signal processing algorithms to suite specific needs

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | |
| **CO2** | 3 | 3 | | | 2 | |
| **CO3** | | | 3 | | | 2 |
| **CO4** | 3 | | | | 3 | |
| **CO5** | 3 | | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1 : SIGNALS AND SYSTEMS**

Basic elements of digital signal Processing – Concept of frequency in continuous time and discretetime signals – Sampling theorem – Discrete time signals, Discrete time systems – Analysis of Linear time invariant systems – Z transform –Convolution and correlation - MATLAB programs for signals and systems.

**UNIT 2 : FAST FOURIER TRANSFORMS**

Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –Use of FFT algorithms in Linear Filtering.

**UNIT 3 : IIR FILTER DESIGN**

Structure of IIR – Analog filter design - Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – Design of IIR filter in the Frequency domain.

**UNIT 4 : FIR FILTER DESIGN**

Structure for FIR systems - Symmetric & Anti-symmetric FIR filters – Linear phase FIR filter – Filter design using windowing techniques (Rectangular Window, Kaiser Window), Frequency sampling techniques - Finite word length effects in digital Filters: Errors, Limit Cycle, Noise Power Spectrum.

**UNIT 5:APPLICATION OF DSP**

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor –Application of DSP: Model of speech wave form – Vocoder – Musical sound processing, Digital music synthesis.

**PRACTICAL EXPERIMENTS**

1. Generation of input Signals.
2. Analysis of linear system [with convolution and de-convolution operation]
3. FIR filters design by Rectangular window using MATLAB Programming.
4. FIR filters design by Kaiser Window using MATLAB Programming.
5. IIR Butterworth filters design using MATLAB Programming.
6. IIR Chebyshev filters design using MATLAB Programming.
7. Implementation of FFT
8. Implementation of Interpolation and decimation
9. Estimation of power spectral density using MATLAB Programming
10. Spectral analysis using MATLAB Programming
11. Verification of linear phase characteristics of FIR filters

**TEXT BOOK**

1. John G. Proakis& Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007.

**REFERENCES**

1. Alan V Oppenheim, Ronald W Schafer and John R Buck, "Discrete Time Signal Processing", PHI/Pearson Education, 2010.
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.
3. Andreas Antoniou, "Digital Signal Processing", Tata Mc Graw Hill, 2006.

213INT1309: INFORMATION SECURITY

| 213INT1309 | INFORMATION SECURITY | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- Apply the basic security algorithms and policies required by computing system.
- Predict the vulnerabilities across any computing system and hence be ableto design a security solution for any computing system.

**COURSE OUTCOMES:**

**CO1.** To introduce the concepts and models of security in computing.

**CO2.** To design and implement symmetric and asymmetric cryptosystems.

**CO3.** To explain the security standards followed at the network level and at theapplication level.

**CO4.** To estimate the level of security risk faced by an organization and the counter measures to handle the risk.

**CO5** To know about the software security development model.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | | |
| **CO2** | | 3 | 3 | | | 2 |
| **CO3** | | | 3 | 3 | | |
| **CO4** | 3 | | | | | |
| **CO5** | 3 | | | | 2 | |

**COURSE TOPIC(S) :**

**UNIT 1: SECURITY - AN OVERVIEW**

Basics of Security - CIA Triad - Threats, Attacks and Controls - Security Models- Bell-LaPadulamodel - Biba Integrity model - Chinese Wall model - Malicious Logic - Viruses, Worms, Logic Bombs - Basics of Cryptography - Mathematics for Cryptography - Modulo Arithmetic - Euclidean and extended Euclidean Theorem - Chinese Remainder Theorem - Euler and Fermat theorem - Classical Cryptosystems - Substitution and Transposition.

**UNIT 2: ADVANCED CRYPTOGRAPHY**

DES and AES - Public Key Cryptography - RSA and ElGamal algorithms - Authentication and Key Exchange - Biometric authentication - Diffie Hellman and Needem Schroeder algorithms - Elliptic Curve Cryptosystems - Digital Signatures - Message Digest - Certificates - Directories andRevocation of keys and certificates.

**UNIT 3: SECURITY STANDARDS**

Public Key Infrastructure - Kerberos - X.509 - IPSec - Virtual Private Networks - E-Mail Security- PGP and PEM - Web Security - Secured DNS - SSL, TLS and SET - CoBITFramework- Compliances - Credit Card Applications - GLBA.

**UNIT 4: SECURITY PRACTICES**

Vulnerability Analysis - Flaw Hypothesis Methodology, NRL taxonomy and Aslam‘s model - Auditing - Anatomy of an Auditing System - Design of Auditing Systems - Posteriori Design - Auditing mechanisms - Risk Analysis and Management - Disaster Recovery Planning/Incident Response Planning.

**UNIT 5: SECURE DEVELOPMENT**

Secure Coding - OWASP/SANS Top Vulnerabilities - Buffer Overflows - Incomplete mediation- XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls - Secured Software Development Life Cycle - Evaluation of Security Systems- Case Studies-Legal and Ethical Issues-Cybercrime and computer crime - Intellectual property-Copyright, patent, trade secret - Hacking and Intrusion privacy- Identity theft.

## TEXT BOOKS


1. Charles Pfleeger, Shari Lawrence Pfleeger, Devin N Paul, ―Security in Computing ‖,Pearson,2007.
2. William Stallings, ―Cryptography and Network Security – Principles and Practices‖, PearsonEducation, Sixth Edition, 2013.


## REFERENCES


1. Wade Trappe, Lawrence C Washington, ―Introduction to Cryptography with Coding andTheory‖, Second Edition, Pearson, 2007.
2. Wenbo Mao, ―Modern Cryptography Theory and Practice‖, Pearson, 2004.
3. Behrouz A Forouzan and DebdeepMukhopadhyay, "Cryptography and Network Security",Tata Mc Graw Hill Ltd. 2014.

213INT1310: BLOCKCHAIN TECHNOLOGY

| 213INT1310 | BLOCKCHAIN TECHNOLOGY | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 0 | 3 | 3 |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

By the end of the course, students will be able to

- Understand how blockchain systems (mainly Bitcoin and Ethereum) work,
- To securely interact with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from blockchain technology into their own projects.

**COURSE OUTCOMES:**

**CO1.** Explain design principles of Bitcoin and Ethereum.

**CO2.** Explain the Simplified Payment Verification protocol.

**CO3.** Interact with a blockchain system by sending and reading transactions.

**CO4.** Design, build, and deploy a distributed application.

**CO5** Evaluate security, privacy, and efficiency of a given blockchain system

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | 2 |
| **CO2** | 2 | 3 | | | | |
| **CO3** | | | 1 | | | 3 |
| **CO4** | 2 | 3 | | | 2 | |
| **CO5** | 3 | | | 2 | | |

**COURSE TOPIC(S) :**

**Unit I Introduction**

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete.

**Unit II Cryptography**

Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof. Blockchain: Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

**Unit III Distributed Consensus**

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, SybilAttack, Energy utilization and alternate. Cryptocurrency- History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

**Unit IV Cryptocurrency Regulations**

Stakeholders, Roots of Bitcoin, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy.

**Unit V Blockchain Applications**

Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain

**Text Books**

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press.

**Reference Books**


1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. Dr. Gavin Wood, “ETHEREUM A Secure Decentralized Transaction Ledger,”Yellow paper.2014.

| 213INT1311 | NEURAL NETWORKS AND FUZZY LOGIC | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 1 | 2 | 0 | 4 | 5 |

Prerequisite: Nil

Course Category: Professional Elective

Course Type: Integrated Course with Theory

**COURSE OBJECTIVES:**

- Introduce students to the various neural network and fuzzy systems models.
- Reveal different applications of these models to solve engineering and otherproblems.
- Introduce the theory and applications of artificial neural network and fuzzy systems to engineering applications with emphasis on image processing andcontrol.
- Discuss neural networks and fuzzy systems, architectures, algorithms and applications, including Back-propagation, BAM, Hopfield network, Competitive Learning, Fuzzy inference methods and expert systems.

**COURSE OUTCOME(S):**

**CO1**. Identify different neural network architectures, their limitations and appropriatelearning rules for each of the architectures

**CO2**. Design and implement a neural network simulation (with two modes ofoperation: learning and processing) using a high-level language C++

**CO3**. Demonstrate knowledge and understanding of fuzzy system as applied inengineering and science

**CO4**. Learn the power and usefulness of artificial neural networks in severalapplications including speech synthesis, diagnostic problems, business and finance, robotic control, signal processing, computer vision and many other
problems that fall under the category of pattern recognition

**CO5**. Develop models for different applications using fuzzy system and MatLab

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | | | | | | |
| **CO2** | | | 3 | | 2 | |
| **CO3** | 2 | | | | | 1 |
| **CO4** | 3 | | 2 | 3 | | 3 |
| **CO5** | 3 | 2 | | | | |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION TO NEURAL NETWORKS**

Introduction - Humans and Computers - Organization of the Brain - Biological Neuron - Biological and Artificial Neuron Models - Characteristics of ANN - Models of ANNs - McCulloch-Pitts Model - Feed forward & feedback networks - learning rules - Hebbian learning rule - perception learning rule - delta learning rule - Widrow-Hoff learning rule - correction learning rule - Winner –lake all learning rule - etc.

**UNIT 2: FEED FORWARD NEURAL NETWORKS**

Classification model - Features & Decision regions - training & classification using discrete perception - algorithm - single layer continuous perception networks for linearly separable classifications - linearly non- separable pattern classification - Delta learning rule for multi- perception layer - Generalized delta learning rule -Back-propagation training - learning factors - Examples.

**UNIT 3: ASSOCIATIVE MEMORIES**

Paradigms of Associative Memory - Pattern Mathematics - Hebbian Learning - General Conceptsof Associative Memory - Bidirectional Associative Memory (BAM) Architecture - BAM Training Algorithms - Storage and Recall Algorithm - BAM Energy Function - Hopfield networks - BasicConcepts - Training & Examples - SOM-UN supervised learning of clusters - winner-take-all learning - recall mode, Initialization of weights - seperability limitations del - Historical Developments - Potential Applications of ANN.

**UNIT 4: CLASSICAL SETS**

Introduction to classical sets – properties - Operations and relations -Fuzzy sets –Membership – Uncertainty – Operations – properties - fuzzy relations – cardinalities - membership functions - Overview of Classical Sets - Membership Function - a-cuts - Properties of a-cuts – Decomposition-Theorems - Extension Principle

**UNIT 5: UNCERTAINTY BASED INFORMATION**

Information & Uncertainty - Non specificity of Fuzzy & Crisp sets - Fuzziness of Fuzzy Sets – Fuzzification - Membership value assignment - development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods - Neural network applications - Process identification – control - fault diagnosis - Fuzzy logic applications - Fuzzy logic control and Fuzzy classification.

**TEXT BOOKS**


1. S. Rajasekharan and G. A. Vijayalakshmipai, "Neural Networks, Fuzzy logic, Geneticalgorithms: synthesis and applications", PHI Publication, 2011.
2. John Yen and Reza Langan, "Fuzzy Logic: Intelligence, Control and Information",PearsonEducation, 2011.


**REFERENCES**


1. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education,2005.
2. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks usingMATLAB 6.0", TMH, 2006.
3. James A Freeman and Davis Skapura, Neural Networks Pearson Education, 2002.

213INT1312: SOFT COMPUTING

| 213INT1312 | SOFT COMPUTING | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 | 5 |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To give students knowledge of soft computing theories fundamentals,
- To learn the fundamentals of non-traditional technologies and approachesto solving hard real-world problems.
- To learn and apply artificial neural networks, fuzzy sets and fuzzylogic,and genetic algorithms in problem solving and use of heuristics based on human experience

**COURSE OUTCOMES:**

**CO1.** Learn the importance of tolerance of imprecision and uncertainty for design of robust and low- cost intelligent machines.

**CO2.** Acquire soft computing fundamentals and design systems for solving various real-world problems.

**CO3.** Integrate the knowledge of neural networks, fuzzy logic, genetic algorithms, probabilistic reasoning, rough sets, chaos, hybrid approaches

**CO4.** Learn about fuzzy sets, fuzzy logic , neural networks and form appropriaterules for inference systems

**C05.** Learn about genetic algorithms and other random search procedures forglobal optimum in self-learning situations

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | 1 | | |
| **CO2** | | 3 | | | 2 | |
| **CO3** | 2 | | | | | 1 |
| **CO4** | | | 2 | 3 | | 3 |
| **CO5** | 3 | 2 | | | | |

**COURSE TOPIC(S) :**

**UNIT 1 : NEURAL NETWORKS -I**

(Introduction and Architecture) Neuron, Nerve Structure and Synapse, Artificial Neuron and its Model, Activation Functions, Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks. Various Learning Techniques; Perception and Convergence Rule, Auto-Associative and Hetro-Associative Memory.

**UNIT 2 : NEURAL NETWORKS -II**

(Back Propagation Networks) Architecture: Perceptron Model, Solution, Single Layer

Neural Network, Multilayer Perception Model; Back Propagation Learning Methods, Effect of Learning Rule Co-Efficient ;Back Propagation Algorithm, Factors Affecting Back Propagation Training, Applications.

**UNIT 3:FUZZY LOGIC -I**

(Introduction) Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion.

**UNIT 4 : FUZZY LOGIC –II**

(Fuzzy Membership, Rules) Membership Functions, Interference in Fuzzy Logic, Fuzzy If

-Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Industrial Applications

**UNIT 5:GENETIC ALGORITHM**

Basic Concepts, Working Principle, Procedures of GA, Flow Chart of GA, Genetic Representations, (Encoding) Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Applications

**TEXTBOOKS:**


1. S. Rajasekaran and G.A. VijayalakshmiPai, ―Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications‖, Prentice Hall of India, 2003.
2. N.P.Padhy,‖Artificial Intelligence and Intelligent Systems‖, Oxford University Press, 2005.
3. J.S.R. Jang, C.T. Sun and E. Mizutani, ―Neuro-Fuzzy and Soft Computing‖, Pearson Education, 2004.


**REFERENCES:**


1. Siman Haykin, ―Neural Networks ‖, Prentice Hall of India, 1999
2. Timothy J. Ross, ―Fuzzy Logic with Engineering Applications‖, Third Edition, Wiley India, 2010
3. S.Y.Kung, ―Digital Neural Network‖, Prentice Hall International, 1993.
4. Aliev.R.A and Aliev,R.R, ― Soft Computing and its Application‖, World Scientific Publishing Company, 2001

213INT1313: DEEP LEARNING

<table>
<tr><td rowspan="2">213INT1313</td><td rowspan="2">DEEP LEARNING</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>0</td><td>4</td><td>5</td></tr>
<tr><td colspan="8">Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- To present the mathematical, statistical and computational challenges ofbuilding neural networks
- To study the concepts of deep learning
- To introduce dimensionality reduction techniques
- To enable the students to know deep learning techniques to support real-time applications
- To examine the case studies of deep learning techniques

**COURSE OUTCOMES:**

**CO1.** Understand basics of deep learning

**CO2.** Implement various deep learning models

**CO3.** Realign high dimensional data using reduction techniques

**CO4.** Analyze optimization and generalization in deep learning

**C05.** Explore the deep learning applications

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | 3 | 3 |
| **CO2** | 3 | 3 | | | 3 | 3 |
| **CO3** | | | | | 3 | 3 |
| **CO4** | 3 | | | | | |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1 : INTRODUCTION**

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates

**UNIT 2: DEEP NETWORKS**

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks- Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning

**UNIT 3: DIMENTIONALITY REDUCTION**

Linear (PCA, LDA) and manifolds, metric learning – Auto encoders and dimensionality reductionin networks – Introduction to Convnet – Architectures – AlexNet, VGG, Inception, ResNet – Training a Convnet: weights initialization, batch normalization, hyperparameter optimization

**UNIT 4: OPTIMIZATION AND GENERALIZATION**

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization-Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM – Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning – Computational & Artificial Neuroscience

**UNIT 5: CASE STUDY AND APPLICATIONS**

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec JointDetection-BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions.

**REFERENCES:**

1. CosmaRohillaShalizi, Advanced Data Analysis from an Elementary Point of View,
2. 2015.Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press, 2016.

4. Michael Nielsen, Neural Networks and Deep Lear,ning, Determination Press, 2015.

213INT1314: WEB SERVICES

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **213INT1314** | **WEB SERVICES** | **2** | **0** | **2** | **0** | **3** | **4** |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn the theoretical and practical concepts of web programming.
- To introduce the programming languages for developing simple webapplications.
- To make students to understand about the architecture of web serverand deployment of web site
- To teach methodologies useful for the implementation of dynamic webapplications
- To efficiently design and implement web applications using server side programming languages

**COURSE OUTCOMES:**

**CO1.** Understand the theoretical and practical concepts (internet basics) to design, implement and maintain a typical web page, to understand different protocols used over the internet, to obtain good knowledge in web programming in JavaScript

**CO2.** Develop and incorporate dynamic capabilities in Web pages using DHTML and JavaScript.

**CO3.** Understand the basic concepts of client-server architecture, features, web applications, web servers to deploy web site, to include multimedia contents

**CO4.** Understand database basics related to develop dynamic web applications and Apply XML for designing web pages.

**CO5.** Apply advanced web development programming to design and implement server-side software that interacts with a database for the purposes of querying the database, test and debug the software, deploy the software, to3 design and implement interactive web pages

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | | 3 | 3 |
| **CO2** | 3 | 3 | | | 3 | 3 |
| **CO3** | | | | | 3 | 3 |
| **CO4** | 3 | | | | | |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1 : INTRODUCTION**

History and basic idea of Internet; Internet services: telnet, e-mail, ftp, WWW- HTML- List, Tables, Images, Forms, Frames, XML- Document type definition, XML Schemas,* Document Object model - Web page design: Designing web pages with HTML5 – New elements added - semantic elements -attributes of form -graphic elements- multimedia elements-APIs-CSS- javascript-J query-AJAX

**UNIT 2: DYNAMIC HTML**

Introduction – Object refers, Dynamic style, Dynamic position, frames, navigator, Event Model– On check – On load – On error – Mouse related – Form process – Event Bubblers – Filters – Transport with the Filter – Creating Images – Adding shadows – Creating Gradients –Creating Motion with Blur – Data Binding – Simple Data Binding – Moving with a record set –Sorting table data – Binding of an Image and table**.**

**UNIT 3: MULTIMEDIA**

Audio and video speech synthesis and recognition – Electronic Commerce – E-Business Model– E- Marketing – Online Payments and Security – Web Servers – HTTP request types –System Architecture – Client Side Scripting and Server side Scripting – Accessing Web servers–IIS – Apache web server**.**

**UNIT 4 :ASP**

ASP – Working of ASP – Objects –File System Objects – Session tracking and cookies – ADO–Access a Database from ASP –Server side Active-X Components – Web Resources –

XML – Structure in Data – Name spaces– DTD – Vocabularies – DOM methods

**UNIT 5 :DATABASE CONNECTIVITY**

Database Connectivity - ADO.NET- Sql Connection- Sql Command- Reading Data with the Sql Data Reader - Working with Disconnected Data - Adding Parameters to Commands - Using Stored Procedures

**TEXT BOOK**


**1.** Deitel & Deitel, Goldberg, "Internet and World Wide Web 5th Edition – How to Program", Pearson Education Asia, 2012**.**


**REFERENCES**


1. Eric Ladd, Jim O' Donnel, "Using HTML 4, XML and JAVA1.2", Prentice Hall of India, QUE, 1999.
2. Aferganatel, "Web Programming: Desktop Management", PHI, 2004.
3. Rajkamal, "Web Technology", Tata McGraw-Hill, 2001.

213INT1315: MANAGING THE CLOUD

| 213INT1315 | MANAGING THE CLOUD | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 3 | 4 |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To impart fundamental concepts in the area of cloud computing.
- To impart knowledge in developing applications of cloudcomputing

**COURSE OUTCOMES:**

**CO1.** Understanding the systems, protocols and mechanisms to support cloudcomputing

**CO2.** Develop applications for cloud computing

**CO3.** Understanding the hardware necessary for cloud computing

**CO4.** Design and implement a novel cloud computing application

**CO5.** Knowledge in various Cloud vendors and their products

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | 3 | |
| **CO2** | | 3 | | | 3 | 3 |
| **CO3** | | | | 1 | 3 | |
| **CO4** | 3 | | | | | |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

Overview – applications - intranet and cloud - examples: Amazon, Google, Microsoft, IBM – Benefits and Limitations of cloud computing - Google app engine – EMC - NETAPP - Microsoft Azure - Amazon(EC2, S3,SQS) - open stack -cloud computing services

**UNIT 2: HARDWARE AND ARCHITECTURE**

Clients-Security-Network-Services. Accessing the cloud: Platforms-web applications-web APIs- web browsers. Cloud storage: overview-providers. Standards: application-client-infrastructure- service.

**UNIT 3: SOFTWARE AS SERVICE**

Overview- Driving forces-company offerings-industries. Software plus services: Overview-mobile device integration-providers-Microsoft Online.

**UNIT 4: DEVELOPING APPLICATIONS**

Google – Microsoft – Intuit QuickBase - Cast Iron Cloud - Bungee Connect –Development (App engine, Azure, open stack etc.) - trouble shooting and application management.

**UNIT 5: LOCAL CLOUDS AND THIN CLIENTS**

Virtualization-server solutions-thin clients. Cloud Migration: cloud services for individuals-enterprise cloud- methods for migration-analyzing cloud services.

**TEXT BOOKS**

1. Anthony T.Velte, Toby Velte, "Cloud Computing a practical approach", Mcgraw Hill,2010.

   M.S.V.Janakiram, "Demystifying the Cloud – An introduction to Cloud Computing",

**REFERENCE BOOKS**

1. Mark C. Chu-Carroll, "Code in the Cloud- Programming Google App Engine", ThePragmatic Bookshelf Raleigh, North Carolina Dallas, Texas, 2011.
2. Breslin "Cloud Computing: Principles and Paradigms", Wiley Press, New York, USA, 2008.

213INT1316 : ROBOTIC PROGRAMMING

| 213INT1316 | ROBOTIC PROGRAMMING | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To understand the basic concepts associated with the design and Functioningand applications of Robots .
- To study about the drives and sensors used in Robots.
- To learn about analyzing robot kinematics and robot programming.

**COURSE OUTCOMES:**

**CO1.** Upon completion of this course, the students can able to apply the basic engineering

**CO2.** To learn about knowledge for the design of robotics

**CO3.** Will understand robot kinematics and robot programming.

**CO4.** Will understand application of Robots

**CO5.** To understand the Sensors to use in robotics

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | | |
| CO2 | | 3 | | 2 | | |
| CO3 | 2 | | | | | 3 |
| CO4 | | | 1 | | 2 | |
| CO5 | 3 | | | | | 3 |

## COURSE TOPIC(S)

### UNIT I-Introduction to Robot Programming

Robot programming-Introduction-Types- Flex Pendant- Lead through programming, Coordinate systems of Robot, Robot controller- major components, functions-Wrist Mechanism- Interpolation-Interlock commands Operating mode of robot, Jogging-Types, Robot specifications- Motion commands, end effectors and sensors commands.

### UNIT II-VAL Language

Robot Languages-Classifications, Structures- VAL language commands motion control, hand control, program control, pick and place applications, palletizing applications using VAL, Robotwelding application using VAL program-WAIT, SIGNAL and DELAY command for communications using simple applications. VAL-II programming-basic commands, applications-Simple problem using conditional statements-Simple pick and place applications-Production ratecalculations using robot.

### UNIT III- RAPID Language and AML

R APID language basic commands- Motion Instructions-Pick and place operation using Industrial robot- manual mode, automatic mode, subroutine command based programming. Move master command language-Introduction, syntax, simple problems. AML Language-General description, elements and functions, Statements, constants and variables-Program control statements- Operating systems, Motion, Sensor commands-Data processing.

### UNIT IV- Virtual Robot

Robot cycle time analysis-Multiple robot and machine Interference-Process chart-Simple problems-Virtual robotics, Robot studio online software- Introduction, Jogging, components, work planning, program modules, input and output signals-Singularities-Collision detection-Repeatability measurement of robot-Robot economics.

### UNIT V - AML Language

General description, elements and functions, Statements, constants and variables-Program control statements-Operating systems, Motion, Sensor commands-Data processing.

**TEXT BOOKS:**

1. S. R.Deb, “Robotics technology and flexible automation”, Tata McGraw Hill publishing company limited, 1994.
2. Mikell. P. Groover, “Industrial Robotics Technology”, Programming and Applications, McGraw Hill Co, 1995.

**Reference Books:**

1. Klafter. R.D, Chmielewski.T.A. and Noggin’s., “Robot Engineering : An Integrated Approach”, Prentice Hall of India Pvt. Ltd.,1994.
2. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., “Robotics control, sensing, vision and intelligence”, McGraw Hill Book co, 1987.
3. [R3] Craig. J. J. “Introduction to Robotics mechanics and control”, Addison-Wesley, 1999

213INT1317: STATISTICAL FOUNDATION OF DATA SCIENCE

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **213INT1317** | **STATISTICAL FOUNDATION OF DATA SCIENCE** | **3** | **0** | **2** | **0** | **4** | **5** |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To Prepare the students to understand and practice Big Data Analytics using Hadoop Ecosystem and prepare them for a Career in Analytics as a Hadoop Developer, Hadoop Administrator, Data Scientist.

**COURSE OUTCOMES:**

**CO1.** Understand the key issues on big data, characteristics, data sources andthe associated applications in intelligent business and scientific computing.

**CO2.** Acquire fundamental enabling techniques and scalable algorithms in bigdata analytics.

**CO3.** Interpret business models and scientific computing paradigms, and apply software tools for Big data analytics.

**CO4.** Achieve adequate perspectives of big data analytics in marketing,financialservices, health services, social networking, astrophysics exploration, and environmental sensor applications, etc.

**CO5.** Select visualization techniques and tools to analyze big data and createstatistical models and understand how to handle large amounts of data.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | | | 3 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO2** | | | 3 | | | 3 |
| **CO3** | | 2 | 3 | 3 | | |
| **CO4** | 3 | | | | 2 | |
| **CO5** | 3 | | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION TO BIG DATA**

Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

**UNIT 2: MINING DATA STREAMS**

Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Realtime AnalyticsPlatform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

**UNIT 3: HADOOP**

History of Hadoop- The Hadoop Distributed File System –Components of Hadoop – Analyzing The Data with Hadoop-Scaling Out-Hadoop Streaming-Design of HDFS-Java interfaces to HDFS-Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort–Task execution-Map Reduce Types and Formats

**UNIT 4: HADOOP ENVIRONMENT**

Setting up a Hadoop Cluster -Cluster specification -Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop -Administering Hadoop –HDFS -Monitoring-Maintenance-Hadoop benchmarks-Hadoop in the cloud

**UNIT 5: FRAMEWORKS**

Applications on Big Data Using Pig and Hive –Data processing operators in Pig –Hive services –HiveQL –Querying Data in Hive -fundamentals of HBase and Zoo Keeper -IBM Info Sphere-. Visualizations -Visual data analysis techniques, interaction techniques.

**TEXT BOOKS:**

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

**REFERENCES:**

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge DataStreams with advanced analystics", John Wiley & sons, 2012. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007 Pete Warden, BigData Glossary, O'Reilly, 2011

213INT2301: DATA ANALYSIS WITH PYTHON

| 213INT2301 | DATA ANALYSIS WITH PYTHON | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 | 5 |
| Prerequisite: Python for Programming and Product Development (211CSE1401)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- This course is designed to teach students how to analyze different types of datausing Python.
- Students will learn how to prepare data for analysis, perform simple statistical analysis, create meaningful data visualizations and predict future trends from data.

**COURSE OUTCOMES:**

**CO1.** Explore Python language fundamentals, including basic syntax, variables, and types

**CO2.** Use functions, create and manipulate regular Python lists by using datastructures concepts

**CO3.** Understand the basic object oriented concepts in python

**CO4.** Effectively use numerical analysis libraries of python

**CO5.** Create and customize plots on real data and supercharge your scripts with control flow, and get to know the Pandas Data Frame

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | 3 |
| **CO2** | 3 | | | 3 | | 3 |
| **CO3** | 3 | | 1 | 2 | | 3 |
| **CO4** | | | | | | |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT I: PYTHON FUNDAMENTALS FOR DATA ANALYSIS**

Pythn data structures, Control statements, Functions, Object Oriented programming concepts using classes, objects and methods, Exception handling, Implementation of user- defined Modules and Package, File handling in python.

**UNIT II: INTRODUCTION TO DATA UNDERSTANDING AND PREPROCESSING**

Knowledge domains of Data Analysis, Understanding structured and unstructured data, Data Analysis process, Dataset generation, Importing Dataset: Importing and Exporting Data, Basic Insights from Datasets, Cleaning and Preparing the Data: Identify and Handle Missing Values.

**UNIT III: DATA PROCESSING AND VISUALIZATION**

Data Formatting, Exploratory Data Analysis, Filtering and hierarchical indexing using Pandas Data Visualization: Basic Visualization Tools, Specialized Visualization Tools, Seaborn Creating and Plotting Maps.

**UNIT IV: MATHEMATICAL AND SCIENTIFIC APPLICATIONS FOR DATA ANALYSIS**

Numpy and Scipy Package, Understanding and creating N-dimensional arrays, Basicindexing and slicing, Boolean indexing, Fancy indexing, Universal functions, Data processing using arrays, File input and output with arrays. Analysing Web Data: Data wrangling, Web scrapping, Combing and merging data sets, Reshaping and pivoting, Data transformation, String Manipulation, case study for web scrapping.

**UNIT V: MODEL DEVELOPMENT AND EVALUATION**

Introduction to machine learning- Supervised and Unsupervised Learning, Model development using Linear Regression, Model Visualization, Prediction and Decision Making, Model Evaluation: Over-fitting, Under-fitting and Model Selection.

**TEXT BOOKS**

1. 1.David Ascher and Mark Lutz, Learning Python, Publisher O'Reilly Media.
2. 2.Reema Thareja, "Python Programming using Problem Solving approach",Oxford University press

3. 3.Wes Mckinney "Python for Data Analysis", First edition, Publisher O'Reilly Media.

**REFERENCE BOOKS**

1. Allen Downey ,JeffreyElkner ,Chris Meyers,: Learning with Python, Dreamtech Press
2. David Taieb ,"Data Analysis with Python: A Modern Approach " 1st Edition, Packt Publishing

213INT2302: PRINCIPLES OF COMPILER DESIGN

| 213INT2302 | PRINCIPLES OF COMPILER DESIGN | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 1 | 2 | 0 | 4 | 5 |

Prerequisite: Python for Programming and Product Development

Course Category: Professional Electives

CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

- To understand the basics of computation
- To understand the process in compilation of a programs
- To understand the computer's way of generating code.
- To understand the optimization techniques in code generation

**COURSE OUTCOMES:**

**CO1.** Understand the basics of compilation(computing)
**CO2**. Understand grammar of compilers
**CO3**. Understand the intermediate form of codes in compilers
**CO4**. Understand the code generation technique (Machine code)
**CO5**. Understand the optimization of code in compilers

**MAPPING OF COURSE OUTCOME (CO) WITH ABET STUDENT OUTCOMES(SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | 3 |
| CO2 | | | 3 | | | |
| CO3 | 2 | | | | | |
| CO4 | | | 1 | 3 | | 2 |
| CO5 | 2 | 2 | | | 3 | |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION TO COMPILING**

Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler-Grouping of Phases – Compiler construction tools - Lexical Analysis - Role of Lexical Analyzer-Input Buffering – Specification of Tokens - Recognition of tokens.

**UNIT 2 : SYNTAX ANALYSIS**

Role of the parser –Writing Grammars –Context-Free Grammars – Top Down parsing - Recursive Descent Parsing - Predictive Parsing – Bottom-up parsing - Shift Reduce Parsing – Operator Precedent Parsing - LR Parsers - SLR Parser - Canonical LR Parser - LALR Parser.

**UNIT 3: INTERMEDIATE CODE GENERATION**

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – CaseStatements – Back patching – Procedure calls.

**UNIT 4 : CODE GENERATION**

Issues in the design of code generator – The target machine – Runtime Storage management-Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAGrepresentation of Basic Blocks – Peephole Optimization.

**UNIT 5: CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS**

Introduction– Principal Sources of Optimization – Optimization of basic Blocks Introduction to Global Data Flow Analysis – RuntimeEnvironments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing.

**TEXT BOOK**

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, “Compilers Principles, Techniques and Tools”, Pearson Education Asia, 2011.

**REFERENCES**

1. Allen I. Holub “Compiler Design in C”, Prentice Hall of India, 2003.
2. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings,2003.
3. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill, 2003.

213INT2303: PROGRAMMING WITH OPEN SOURCE SOFTWARE

<table>
<tr><td rowspan="2">213INT2303</td><td rowspan="2">PROGRAMMING WITH OPEN SOURCE SOFTWARE</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>0</td><td>4</td><td>5</td></tr>
<tr><td colspan="8">Prerequisite: Python for Programming and Product Development (211CSE1401)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- To learn about the various Linux distributions.
- To learn the programming practices in FOSS
- To explore Linux embedded device
- To acquire the knowledge of open source programming using embeddedLinux device.

**COURSE OUTCOMES:**

**CO1.** Work in the linux environment and contribute to free and open sourcesoftware

**CO2.** Implement content management systems

**CO3.** Install and configure linux operating system distribution in embeddeddevices that support linux

**CO4.** Build simple hardware projects using embedded linux devices

**CO5.** Create web programming using embedded linux device

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | | | |
| **CO2** | | 3 | | 1 | | |
| **CO3** | 2 | | | | | 3 |
| **CO4** | 3 | | 1 | 3 | | 2 |
| **CO5** | 3 | 2 | | | 3 | |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION TO LINUX BASED DISTRIBUTIONS**

Philosophy - licenses - Distributions - Desktop environments - Bash commands - Files andfile systems - Partitions- Practical: Installing software – Configuration, Bash commands

**UNIT2 : PROGRAMMING TECHNIQUES AND PRACTICES**

Programming using python - GUI development - Menu and toolbar - Layout management - event-dialog - widget - Programming practices - Documentation - use of version control system in FOSS. Practical: GUI development

**UNIT 3: OVERVIEW OF AN EMBEDDED LINUX DEVICE**

Peripherals - Choice of distribution and installation - commands - files and file systems - configuration - game programming. Practical: File systems

**UNIT 4: WEB PROGRAMMING USING EMBEDDED LINUX DEVICE**

Web server - Linux - Apache - Mysql - Php - Content management systems - adding content - text - images - components, modules and plugin- development of a sample content managementsite. Practical: Mysql

**UNIT 5: INTERFACE WITH OTHER HARDWARE**

Basic Inputs and outputs - Scheduling commands with Cron - installing and testing GPIO with python- Expansion boards - Prototyping boards. Practical: Scheduling commands

**TEXT BOOK**

1. Roderick W Smith, “Linux Essentials”, Wiley Publications, 2012.

**REFERENCES**

1. Simon Monk, "Programming the Raspberrypi: Getting started with python", McGrawHill, 2013
2. Stephen Burge,Joomla! 3 Explained: Your step-by-step guide, Pearson education, 2014.

213INT2304: FORMAL LANGUAGE AND AUTOMATA

| 213INT2304 | FORMAL LANGUAGE AND AUTOMATA | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 | 5 |

Prerequisite: Python for Programming and Product Development (211CSE1401)

Course Category: Professional Electives

CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

- To introduce students about the mathematical foundations of computation including automata theory, the theory of formal languages and grammars, the notions of algorithm, decidability, complexity, and computability,
- To enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.

**COURSE OUTCOMES:**

**CO1.** Design the Finite Automata, Deterministic Finite Automata and Non Deterministic Finite Automata

**CO2.** Understand the Regular languages and expressions to given a problem

**CO3.** Apply the context free grammar (CFG) to describe programming languages and evaluate the equivalence of push down automata and CFG.

**CO4.** Design the Turing machine for different languages and simple computations

**CO5** Analyze the Undecidable problem in regular expression and Turing machine

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | | | | | | 2 |
| **CO2** | 3 | | | | | |
| **CO3** | | 3 | 2 | 3 | | |
| **CO4** | 3 | | | | 2 | |
| **CO5** | 2 | 2 | | 3 | | |

**COURSE TOPIC(S) :**

**UNIT 1: AUTOMATA**

Introduction to formal proof – Additional Forms of Proof – Inductive Proofs –Finite Automata (FA)– Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon Transitions.

**UNIT 2: REGULAR EXPRESSIONS AND LANGUAGES**

Regular Expression –Finite Automata and Regular Expressions – Properties of Regular languages: Pumping Lemma for Regular Languages and Applications – Closure Properties of Regular Languages- Equivalence and Minimization of Automata

**UNIT 3: CONTEXT-FREE GRAMMAR AND PUSH DOWN AUTOMATA**

Context-Free Grammar (CFG) – Application- Parse Trees – Ambiguity in Grammars and Languages – Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG - Deterministic Pushdown Automata

**UNIT 4: PROPERTIES OF CFL AND TURING MACHINE**

Normal Forms for CFG – Pumping Lemma for CFL –Applications Properties of CFL –Turing Machines – Programming Techniques for TM: Multiple Stacks, Subroutines-Extensions to the Basic Turing Machine

**UNIT 5: UNDECIDABILITY**

A language that is not Recursively Enumerable (RE) – An Undecidable problem that is RE – Undecidable Problems about Turing Machine – Post_s Correspondence Problem - The classes P and NP - NP complete-Complements of Languages in NP

**PRACTICE COMPONENTS**

1. Create the Deterministic Finite Automata using JFLAP simulator
2. Create the Non-Deterministic Finite Automata using JFLAP simulator
3. Construct a regular expression using JFLAP. Use Convert→Convert FA to RE.
4. Construct a Grammar using JFLAP
5. Convert regular expressions to FA
6. Create Regular Grammar and convert to Finite Automaton
7. Create a PDA that accepts strings that contains the language L = {axcb2x

| where x ≥ 0} usingthe alphabet Σ = {a,b,c}.

8. Create each PDA with at least five test results with the following languages over alphabet:= {a,b}

   a) L = {anbn | where n > 0}

   b) L = {anbncn | where n > 0}

9. Construct PDA for any given grammar.

**TEXT BOOK**


1. Hopcroft J.E,Motwani R and Ullman J.D, “Introduction to Automata Theory, Languages and Computations”, Third Edition, 2006.


**REFERENCE BOOKS**


1. Martin J, “Introduction to Languages and the Theory of Computation”, Third Edition, TMH, 2003
2. Lewis H. R and Papadimitriou C.H , “Elements of The theory of Computation”, United States Edition, 1997.

213INT2305: SPEECH AND NATURAL LANGUAGE PROCESSING

| 213INT2305 | SPEECH AND NATURAL LANGUAGE PROCESSING | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Python for Programming and Product Development (211CSE1401)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn the fundamentals of natural language processing
- To appreciate the use of CFG and PCFG in NLP
- To understand the role of semantics and pragmatics

**COURSE OUTCOMES:**

**CO1.** To tag a given text with basic Language features

**CO2.** To design an innovative application using NLP components

**CO3.** To implement a rule based system to tackle morphology/syntax of a language

**CO4.** To design a tag set to be used for statistical processing for real-time applications

**C05.** To compare and contrast use of different statistical approaches for different typesof NLP applications

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | |
| CO2 | | 3 | | 2 | | |
| CO3 | 3 | | | | | 3 |
| CO4 | | | | | | 3 |
| CO5 | 3 | 2 | | | | |

**COURSE TOPIC(S) :**

**UNIT 1 : INTRODUCTION**

Words-Regular Expressions and Automata -Words and Transducers -N-grams -Part-of-Speech –Tagging -Hidden Markov and Maximum Entropy Models.

**UNIT 2: SPEECH**

Speech–Phonetics -Speech Synthesis -Automatic Speech Recognition -Speech Recognition: -Advanced Topics -Computational Phonology

**UNIT 3: SYNTAX**

Formal Grammars of English -Syntactic Parsing -Statistical Parsing -Features and Unification -Language and Complexity.

**UNIT 4: SEMANTICS AND PRAGMATICS**

The Representation of Meaning -Computational Semantics -Lexical Semantics -Computational Lexical Semantics -Computational Discourse

**UNIT 5: APPLICATIONS**

Information Extraction -Question Answering and Summarization -Dialogue and Conversational Agents -Machine Translation.

**TEXTBOOKS:**

1. Daniel Jurafsky,―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech‖, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing withPython‖, First Edition, O'Reilly Media, 2009.

**REFERENCES:**

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook‖, AtlanticPublisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java‖, O'Reilly Media,2015.3.Nitin IndurkhyaandFred J. Damerau, ―Handbook of Natural Language Processing‖,Second Edition, Chapman and Hall/CRC Press, 2010.

213INT2306: SYSTEM SOFTWARE

| 213INT2306 | SYSTEM SOFTWARE | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 | 5 |

Prerequisite: Computer Organization and Assembly Language Programming(212INT1101)
Course Category: Professional Electives
CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

- To introduce the essential concepts of System Programming
- To know about the functions of loaders, linkers and macroprocessors.

**COURSE OUTCOMES:**

**CO1.** Know the background Knowledge of System Software

**CO2.** Design a simple Assembler

**CO3.** Identify the use of Linkers and Loaders

**CO4.** Understand Machine Independent Macro Processor

**CO5.** Formulate various Compilers and Interpreters

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | | 3 | | | |
| CO2 | | 3 | | | 3 | |
| CO3 | 3 | | | | | 3 |
| CO4 | 3 | 3 | | | | |
| CO5 | | 3 | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1 : BACKGROUND**

Introduction – System Software and Machine Architecture – The Simplified Instructional Computer (SIC) – Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming. Practical: Basic system programming

**UNIT 2 : ASSEMBLERS**

Basic Assembler Functions – Machine Dependent Assembler Features – Machine Independent Assembler Features – Program relocation - Machine independent assembler

features - Literals –Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers -Implementation example - MASM assembler. Practical: Assembly language programming

**UNIT 3: LOADERS AND LINKERS**

Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader -Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features – Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker. Practical: Dynamic link programming

**UNIT 4: MACRO PROCESSORS**

Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language. Practical: Macro implementation

**UNIT 5: SYSTEM SOFTWARE TOOLS**

Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems - Debugging functions and capabilities – Relationship withother parts of the system – User-Interface Criteria. Practical: User interface design

**TEXT BOOK**

1. Leland L. Beck, “System Software – An Introduction to Systems Programming”, 3rd Edition, Pearson Education Asia, 2006.

**REFERENCES**

1 .J. Nithyashri, “System Software”, Tata McGraw Hill, 2nd Edition, 2010.

2. A.A. Puntambekar, I. A. Dhotre, “System Programming”, McGraw Hill, 2008.

213INT2307: DISTRIBUTED SYSTEMS

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **213INT2307** | **DISTRIBUTED SYSTEMS** | **3** | **0** | **2** | **0** | **4** | **5** |
| Prerequisite: Computer Organization and Assembly Language Programming (212INT1101)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To expose students to both the abstraction and details of file systems.
- To introduce concepts related to distributed computing systems.
- To focus on performance and flexibility issues related to systems designdecisions.
- To expose students to current literature in distributed systems.

**COURSE OUTCOMES:**

**CO1.** Understand various models of distributed systems

**CO2.** Aware of distributed file systems

**CO3.** Identify the needs of distributed systems implementation

**CO4.** Construct work flows as such in distributed systems

**CO5** Design distributed systems

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | 1 | | |
| **CO2** | 2 | | | | | 2 |
| **CO3** | | 3 | | 3 | | |
| **CO4** | 2 | 3 | | | 3 | |
| **CO5** | 2 | | | | | 2 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

Characterization of Distributed Systems- Examples of distributed systems - Challenges- System Models-Physical models-Architectural models - Fundamental models - Introduction to inter- processcommunications-External data representation and marshalling- Multicast communication- Network virtualization -Overlay networks – Practical : MPI and World Wide Web, Remote Method Invocation program

**UNIT 2: DISTRIBUTED OBJECTS AND FILE SYSTEM**

Introduction - Distributed objects -From objects to components-Case studies: Enterprise JavaBeansand Fractal - Introduction to DFS - File service architecture - Sun network file system -The AndrewFile System- Introduction to Name Services- Name services and DNS - Directory and directory services Practical : The Global Name Service, The X.500 Directory Service.

**UNIT 3: DISTRIBUTED OPERATING SYSTEM SUPPORT**

The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Virtualization at the operating system level - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical timeand logical Clocks - Global states - Distributed debugging. Practical :CORBA using Java program, Java deadlock program

**UNIT 4: TRANSACTION AND CONCURRENCY CONTROL – DISTRIBUTED TRANSACTIONS**

Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery. Practical: Concurrency control using DBMS

**UNIT 5: DISTRIBUTED SYSTEM DESIGN AND DISTRIBUTED MULTIMEDIA SYSTEMS**

Introducing the case study: Google- Overall architecture and design philosophy- Underlying communication paradigms- Data storage and coordination services- Distributed computation services- Introduction to distributed multimedia systems- Characteristics of multimedia data - Quality of service management - Resource management- Stream adaptation- Practical : Tiger, BitTorrent and End System Multicast.

**TEXT BOOK**

1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Addison Wesley, May 2011.

**REFERENCES**

1. A.S.Tanenbaum, M.Van Steen, “Distributed systems: principles and paradigms”,PearsonPrentice Hall, 3rd Edition, 2007.
2. MukeshSinghal, “Advanced Concepts In Operating Systems”, McGraw-Hill Series in Computer Science, Ohio State University, Columbus 2001.

213INT2308: SERVICE ORIENTED ARCHETECTURE

| 213INT2308 | SERVICE ORIENTED ARCHETECTURE | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 3 | 4 |
| Prerequisite: Computer Organization and Assembly Language Programming(212INT1101)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn the concepts of distributed application development
- To differentiate XML based web services from other standard models
- To study the importance of service composition

**COURSE OUTCOMES:**

**CO1.** Understand crucial concepts of SOA

**CO2.** Know the integration of SOA technological points with Web Services.

**CO3.** Implement of SOA in development cycle of Web Services.

**CO4.** Build SOA based applications for Web services, somestandards and Technologies of Web Services.

**CO5.** Implement the applications based on Java Web Services

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | | 3 | | | | 3 |
| **CO2** | | | | 1 | | |
| **CO3** | 3 | 3 | | | | 3 |
| **CO4** | 3 | 2 | 1 | | | |
| **CO5** | 3 | | | 2 | 3 | 3 |

**COURSE TOPIC(S) :**

**UNIT 1 : SOA FUNDAMENTALS**

SOA – Services – Loose Coupling – The Enterprise service bus – Service Classification – Business process management – SOA and the organization – SOA and the organization - SOAin context – Message exchange patterns – SOA life cycle – Versioning – Web services

**UNIT 2:SERVICE-ORIENTED ANALYSIS AND DESIGN**

SOA Terminology and Concepts - REST Design Constraints and Goals - RESTful Service-Orientation - Service Contracts with REST - Service-Orientation and REST Service-Oriented Analysis and Design with REST - Mainstream SOA Methodology - Analysis and Service Modeling with REST - Service-Oriented Design with REST HTML - Cookies - Simple PHP scripts

**UNIT 3 : SERVICE COMPOSITION**

Service Composition with REST - Fundamental Service Composition with REST - Advanced Service Composition with REST - Service Composition with REST Case Study - Design Patternsfor SOA with REST - Service Versioning with REST - Uniform Contract Profiles

**UNIT4: RESTFULSERVICESANDTHERESOURCE-ORIENTED ARCHITECTURE**

Introducing the Simple Storage Service - Object-Oriented Design of S3 - URIs – Addressability-Statelessness - Representations - Links and Connectedness - The Uniform Interface - ResourceDesign - Turning Requirements into Read-Only Resources - Service Implementation - Web service case studies - Connect Resources to Each Other – Controller Code - Model Code

**UNIT 5 : SOA TRANSACTION AND SECURITY**

SOA and performance - SOA and security – Service Management - Model driven service deployment – Establishing SOA and SOA governance

**TEXT BOOK**

1. 1 Nicolai M.Josuttis, “SOA in design - The art of distributed system design”, O'REILLY publication, 2007.
2. 2. Raj Balasubramanian, Benjamin Carlyle, Thomas Erl, Cesare Pautasso, "SOA with REST - Principles, Patterns & Constraints for building Enterprise solutions with REST",Prentice Hall/PearsonPTR , 2012.
3. 3. Leonard Richardson and Sam Ruby, “RESTful Web Services”, O'REILLY publication,2007.

## REFERENCES

1. Thomas Erl, “Service Oriented Architecture: Concepts, Technology, and Design”, Pearsoneducation,2005

213INT2309: REAL TIME SYSTEMS

| 213INT2309 | REAL TIME SYSTEMS | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Operating Systems Concepts (212INT2302)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- Explain and apply the fundamental concepts and terminology of real-timesystems.
- Explain and address the fundamental problems of real-time systems.
- Analyze real-time systems designs.
- Design a real-time system.
- Identify and assess the relevant literature and research trends of real-timesystems

**COURSE OUTCOMES:**

**CO1.** Understand the basics and importance of real-time systems

**CO2.** Implement a high-level analysis document based on requirements specifications

**CO3.** Implement a high-level design document based on analysis documentation

**CO4.** Implement a test plan based on requirements specification

**CO5** Implement a validation plan based on all documentation

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 2 | 3 | | | | |
| **CO3** | 3 | | | 2 | | |
| **CO4** | | | | 3 | | 2 |
| **CO5** | 2 | | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

Introduction-Issues in real time computing-Architecture of Real time Systems and Embedded Systems – Operating Systems issues – Performance Measures – Estimating Program runtimes.

**UNIT 2:TASK ASSIGNMENT AND SCHEDULING**

Classical uniprocessor Scheduling algorithms - uniprocessor Scheduling of IRIS Tasks – Tasks Assignment -Mode charges -Fault tolerant scheduling.

**UNIT 3: PROGRAMMING LANGUAGES AND TOOLS**

Desired language characteristics based on ADA – Data typs – Control Structures – Packages – Exception Handling – Overloading – Multitasking – Timing specification – Task Scheduling – Just-intime Compilation – Runtime support.

**UNIT 4 : REAL TIME DATA BASES**

Basic networking principles – Real time databases –Real time Vs general purpose data base-Transaction processing – Concurrency control – Disk scheduling algorithms – Serialization and Consistency-Data base for hard real time systems.

**UNIT 5: FAULT TOLERANCE, RELIABILITY AND SYNCHRONIZATION**

Fault types – Fault detection and containment – Redundancy – Data diversity – Reversal checks-Obtaining parameter values – Reliability models for hardware redundancy – Software error models – Clocks – Fault tolerant synchronization – Synchronization in software.

**TEXT BOOK**

1. Krishna C.M., Kang G.Shin, “Real -Time Systems”, McGraw-Hill, International Editions, 2010.

**REFERENCES**

1. Raymond J.A. Buhr, Donald L. Bailey, “An Introduction To Real Time Systems”,Prentice Hall International, 1999.
2. Stuart Bennett, “Real Time computer control-An Introduction”, PHI, 2004.

213INT2310: DESIGN AND ANALYSIS OF ALGORITHM

| 213INT2310 | DESIGN AND ANALYSIS OF ALGORITHM | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Structures and Algorithms (212INT2303)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

**COURSE OUTCOMES:**

**CO1.** Apply the basic concepts of algorithms and analyze the performance of algorithms

**CO2.** Identify various algorithm design techniques for developing algorithms

**CO3.** Analysis various searching, sorting and graph traversal algorithms

**CO4.** Understand NP completeness and identify different NP complete problems

**CO5.** Formulate the advanced topics on algorithms

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | | | | | 3 | |
| **CO2** | 22 | 3 | | | | |
| **CO3** | | 2 | | | 3 | |
| **CO4** | 3 | | | | | 2 |
| **CO5** | 3 | 1 | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1 : BASIC CONCEPTS OF ALGORITHMS**

Introduction – Notion of Algorithm – Fundamentals of Algorithmic Solving – Important Problem types – Fundamentals of the Analysis of Algorithm Efficiency - Analysis Framework – Asymptotic Notations andBasic Efficiency Classes.

**UNIT 2 : MATHEMATICAL ASPECTS AND ANALYSIS OF ALGORITHMS**

Mathematical Analysis of Non-recursive Algorithm – Mathematical Analysis of Recursive Algorithm – Example: Fibonacci Numbers – Empirical Analysis of Algorithms – Algorithm Visualization. Practical: Mathematical Analysis of Recursive Algorithm

**UNIT 3: ANALYSIS OF SORTING AND SEARCHING ALGORITHMS**

Brute Force – Selection Sort and Bubble Sort – Sequential Search and Brute-force string matching - Divide and conquer – Merge sort – Quick Sort – Binary Search – Binary tree-Traversal and Related Properties – Decrease and Conquer – Insertion Sort – Depth first Search and Breadth First Search. Practical: Sorting

**UNIT 4: ALGORITHMIC TECHNIQUES**

Transform and conquer – Presorting – Balanced Search trees – AVL Trees – Heaps and Heap sort - Dynamic Programming – Warshall's and Floyd's Algorithm – Optimal Binary Search trees – Knapsack problem and memory functions - Greedy Techniques – Prim's Algorithm – Kruskal'sAlgorithm – Dijkstra's Algorithm – Huffman trees. Practical: Trees

**UNIT 5: ALGORITHM DESIGN METHODS**

Backtracking – n-Queen's Problem – Hamiltonian Circuit problem – Subset-Sum problem – Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem

NP and NP-Complete problems – Approximation Algorithms for NP – Hard Problems.

Practical: Knapsack problem

**TEXT BOOK**

1.Anany Levitin, "Introduction to the Design and Analysis of Algorithm", 3rd Edition, Pearson Education India, 2013.

2.T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", PHI Learning Private Limited, 2012..

**REFERENCES**

1.T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, “Introduction to Algorithms”, PHI Pvt. Ltd., 2001.

2.Sara Baase and Allen Van Gelder, “Computer Algorithms - Introduction to Design and Analysis”, 2nd Impression, Pearson Education India, 2008.

3.A.V.Aho, J.E. Hopcroft and J.D.Ullman, “The Design and Analysis of Computer Algorithms”, Pearson Education Asia, 2003.

213INT2311: COMPONENT BASED TECHNOLOGY

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **213INT2311** | **COMPONENT BASED TECHNOLOGY** | **L**<br>**3** | **T**<br>**0** | **P**<br>**2** | **X**<br>**0** | **C**<br>**4** | **H**<br>**5** |
| Prerequisite: Object Oriented Programming using Java (212INT2304)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To deal with the fundamental properties of components, technology andarchitecture and middleware.
- Students are given exposure to java based component technologies suchasJava Beans, EJB and RMI.
- To impart knowledge on component technologies such as CORBA, ORB and application server.
- To introduce COM, DCOM and .NET technologies.
- To identify the component frameworks and its development

**COURSE OUTCOMES:**

**CO1.** Demonstrate how components can be the key to successful software design, construction & delivery of software solutions through reuse

**CO2.** Familiarity with the Java realization of components including Java Beans,EJB, and Java RMI

**CO3.** Expertise with the CORBA realization of components

**CO4.** Gaining extensive information about distributed object systems and masteringthe .NET realization of components (.NET assemblies)

**CO5.** Provide in depth knowledge in component frameworks & its development

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | | 2 |
| **CO2** | 3 | 3 | | | | 3 |
| **CO3** | 3 | 2 | | | | 3 |
| **CO4** | 3 | 2 | | | | 3 |
| **CO5** | 3 | 3 | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1 : INTRODUCTION**

Software Components – objects – fundamental properties of Component technology – modules
– interfaces – callbacks – directory services – component architecture – components and middleware. Practical: Development of simple com components in VB and use them in applications.

**UNIT 2 : JAVA BASED COMPONENT TECHNOLOGIES**

Threads – Java Beans – Events and connections – properties – introspection – JAR files – reflection – object serialization – Enterprise Java Beans – Distributed Object models – RMI andRMI-IIOP. Practical: Deploying EJB for simple arithmetic operator.

**UNIT 3 : CORBA COMPONENT TECHNOLOGIES**

Java and CORBA – Interface Definition language – Object Request Broker – system object model – portable object adapter – CORBA services – CORBA component model – containers – application server – model driven architecture. Practical: SIMPLEAPPLICATION USING CORBA

**UNIT 4: NET BASED COMPONENT TECHNOLOGIES**

COM – Distributed COM – object reuse – interfaces and versioning – dispatch interfaces –connectable objects – OLE containers and servers – Active X controls – .NET components -assemblies – appdomains – contexts – reflection – remoting. Practical: Sample applications.

**UNIT 5 : COMPONENT FRAMEWORKS AND DEVELOPMENT**

Connectors – contexts – EJB containers – CLR contexts and channels – Component Frameworks- Object-Oriented Frameworks (OOFW) - Black Box component framework – directory objects – cross-development environment – component-oriented programming – Component design and implementation tools – testing tools - assembly tools. Practical: Distributed objects deployment-EJB and CORBA

**TEXT BOOK**

1. Clemens Szyperski, "Component Software: Beyond Object-Oriented Programming",Pearson Education publishers, 2003.

**REFERENCES**

1. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 2002.
2. Mowbray, "Inside CORBA", Pearson Education, 2003.
3. Freeze, "Visual Basic Development Guide for COM & COM+", BPB Publication,2001.

213INT2312 : C# AND .NET PROGRAMMING

<table>
<tr><td rowspan="2">213INT2312</td><td rowspan="2">C# AND .NET PROGRAMMING</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>0</td><td>4</td><td>5</td></tr>
<tr><td colspan="8">Prerequisite: Object Oriented Programming using Java (212INT2304)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- To learn the technologies of the .NET framework.
- To cover all segments of programming in C# starting from the language basics, followed by the object oriented programming concepts.
- To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET.
- To introduce advanced topics namely data connectivity, WPF, WCF and WPF with C# and .NET 4.5.
- To implement mobile applications using .Net compact framework

**COURSE OUTCOMES:**

**CO1.** Understand the C# programming model

**CO2.** Understand Object oriented concepts of C#

**CO3.** Model and sole Data base applications using C#

**CO4.** Understand and Design web based design

**CO5.** Understand the .NET workflow in detail

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | | |
| **CO2** | 2 | | | 3 | | |
| **CO3** | | 3 | | | | 2 |
| **CO4** | 2 | 2 | | | 3 | |
| **CO5** | 3 | | | | | 2 |

**COURSE TOPIC(S) :**

**UNIT I C# LANGUAGE BASICS**

.Net Architecture – Core C# – Variables – Data Types – Flow control – Objects and Types Classesand Structs – Inheritance- Generics – Arrays and Tuples – Operators and Casts – Indexers- Assemblies – Shared Assemblies – CLR Hosting – App domains.

**UNIT II C# ADVANCED FEATURES**

Delegates – Lambdas – Lambda Expressions – Events – Event Publisher – Event Listener – Strings and Regular Expressions – Generics – Collections – Memory Management and Pointers – Errors and Exceptions – Reflection.

**UNIT III BASE CLASS LIBRARIES AND DATA MANIPULATION**

Diagnostics Tasks – Threads and Synchronization – Manipulating XML – SAX and DOM – Manipulating files and the Registry – Transactions – Data access with ADO.NET: Introduction, LINQ to Entities and the ADO.NET Entity Framework, Querying a Database with LINQ – Creating the ADO.NET Entity Data Model Class Library, Creating a Windows Forms Project – Data Bindings Between Controls and the Entity Data Model – Dynamically Binding Query Results.

**UNIT IV WINDOW AND WEB BASED APPLICATIONS**

Window Based Applications – Core ASP.NET – ASP.NET Web Forms – Server Controls,Data Binding – ASP.NET State Management, Tracing, Caching, Error Handling, Security, Deployment, User and Custom Controls – Windows Communication Foundation (WCF) – Introduction to Web Services.

**UNIT V .NET COMPACT FRAMEWORK**

Reflection – .Net Remoting-.Net Security – Localization – Peer-to-Peer Networking – Building P2P Applications – .Net Compact Framework – Compact Edition DataStores – Testing and Debugging – Optimizing performance – Packaging and Deployment.

**PRACTICAL EXPERIMENTS**

1. To write a C# program using Branching and Looping statements
2. To write a C# program using Arrays and Strings methods.

3. To write a C# program using Structures and enumerations
4. To write a C# program using inheritance concepts.
5. To write a C# program using Polymorphism.
6. To write a C# program using interfaces.
7. To write a C# program by using operator overloading
8. To write a C# program using delegates, events, errors and exceptions.
9. To write a C# program using Errors and Exceptions.
10. To build a calculator widget in windows application using C#.

**TEXT BOOKS:**

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, "Professional C# and .NET 4.5", Wiley, 2012.
2. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework", Apress publication, 2012.

**REFERENCES:**

1. Ian Gariffiths, Mathew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O'Reilly, 2010.
2. Andy Wigley, Daniel Moth, Peter Foot, "Mobile Development Handbook", Microsoft Press, 2011.
3. Herbert Schildt, "C# The Complete Reference", Tata McGraw Hill, 2004.

213INT2313: MOBILE APPLICATION DEVELOPEMENT

| **213INT2313** | **MOBILE APPLICATION DEVELOPEMENT** | **L**<br>**3** | **T**<br>**0** | **P**<br>**2** | **X**<br>**0** | **C**<br>**3** | **H**<br>**4** |
|---|---|---|---|---|---|---|---|
| Prerequisite: Object Oriented Programming using Java (212INT2304)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To introduce the programming techniques and design pattern of mobile application development.

**COURSE OUTCOMES:**

**CO1.** Study about the mobile application market and web services for various mobile devices

**CO2.** Understand and develop the various Mobile Information Design and Mobile Platforms

**CO3.** Design the User interface with various features of Android SDK like displaying pictures, menu etc

**CO4.** Utilize the messaging, networking and location based service in Android application

**CO5.** Create, Debug and build the apps for the latest Windows and IOS

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | | | |
| **CO2** | | 3 | | | | |
| **CO3** | 2 | | | | | 3 |
| **CO4** | 3 | 3 | | | | |
| **CO5** | 3 | | 1 | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in Business World – Mobile Web Presence – Mobile Applications – Marketing – Web Services for Mobile Devices – Creating Example Web Service _ Debugging Web Service

**UNIT 2: MOBILE USER INTERFACE DESIGN**

Effective Use of Screen Real Estate – Understanding Mobile Application Users – UnderstandingMobile Information Design – Understanding Mobile Platforms – Using the Tools for Mobile Interface Design – Choosing a Mobile Web Option – Adaptive Mobile Website – Mobile Web Applications with HTML 5

**UNIT 3: ANDROID APPLICATION DEVELOPMENT**

Getting to know the Android User Interfaces – Designing Your User interface using Views – Displaying Pictures and Menus with Views – Using Image views to Display pictures – Using menus with views – Data Persistence – Saving and loading user performances - Persisting data to files – Creating and using Data bases – Content Providers.

**UNIT 4 : ANDROID MESSAGING, NETWORKING, LOCATION BASEDSERVICES**

SMS Messaging, Sending E-mail – Networking – Downloading Binary Data, Text Files-Accessing Web Services – Performing Asynchronous Calls – Location Based Services – Displaying Maps – Getting Location Data – Creating your own services – Communicating between a service and an activity – Binding activities to Services

**UNIT 5: IOS AND WINDOWS PHONE**

Getting started with iOS – iOS Project – Debugging iOS Apps – Objective C Basics – Hello Word App – Building the derby app in iOS – Windows Phone 7 Project – Building Derby App in Windows Phone 7

**TEXT BOOK**

12. Jeff McWherter and Scott Gowell, “Professional Mobile Application Development,” Wrox 2012.

**REFERENCES**

1. Wei – Meng Lee, “Beginning Android Application Development”, Wiley 2011
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in

Practice",Dream
Tech.2012

3. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
4. David Mark, Jack Nutting, Jeff LaMouche, and Fredric Olsson, "Beginning iOS6Development: Exploring the iOS SDK", Apress, 2013

213INT2314 : SOFTWARE QUALITY ASSURANCE

<table>
<tr><td rowspan="2">213INT2314</td><td rowspan="2">SOFTWARE QUALITY ASSURANCE</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>0</td><td>3</td><td>4</td></tr>
<tr><td colspan="8">Prerequisite: Software Construction and Management (212INT2307)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- Understand the quality management process.
- Distinguish between the various activities of quality planning, qualityassurance and quality control.
- Understand the importance of standards in the quality managementprocess and their impact on final product.
- To present the concepts, techniques and metrics for quality assurance insoftware development.
- To develop a good understanding of issues, techniques and tools forsoftware testingand Framework concepts

**COURSE OUTCOMES:**

**CO1.** Understand the need of software quality and learn software project life cycle components

**CO2.** Analyze software development methodologies and testing implementations.

**CO3.** Develop the capability to create good software quality infrastructure with effective management strategies.

**CO4.** Evaluate the performance of software project and develop models for software quality management.

**CO5.** Obtain the knowledge about various quality management standards.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | | 3 | 1 | | | 2 |
| **CO3** | 2 | | | 3 | | 3 |
| **CO4** | 1 | | 1 | 2 | | |
| **CO5** | 3 | | | 3 | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1 : INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE**

Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definitionand objectives – Software quality factors- McCall"s quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.

**UNIT 2 : SQA COMPONENTS AND PROJECT LIFE CYCLE**

Software Development methodologies – Quality assurance activities in the development process-Verification & Validation – Reviews – Software Testing – Software Testing implementations – Quality of software maintenance – Pre-Maintenance of software quality components – Quality assurance tools – CASE tools for software quality – Software maintenancequality – Project Management.

**UNIT3:SOFTWAREQUALITYINFRASTRUCTURE**Procedures and work instructions - Templates - Checklists – 3S development - Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control – Storage and retrieval.

**UNIT 4: SOFTWARE QUALITY MANAGEMENT & METRICS**

Project process control – Computerized tools - Software quality metrics – Objectives of quality measurement – Process metrics – Product metrics – Implementation – Limitations of software metrics – Cost of software quality – Classical quality cost model – Extended model-Application of Cost model.

**UNIT 5: STANDARDS, CERTIFICATIONS & ASSESSMENTS**

Quality manangement standards – ISO 9001 and ISO 9000-3 – capability Maturity Models – CMM and CMMI assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – IEEE 1012 & 1028 – Organization of Quality Assurance – Department management responsibilities – Project management responsibilities – SQA units andother actors in SQA systems.

**TEXT BOOK**

1. Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.

**REFERENCES**


1. Alan C. Gillies, "Software Quality: Theory and Management", International ThomsonComputer Press, 1997.
2. Mordechai Ben-Menachem "Software Quality: Producing Practical ConsistentSoftware", International Thompson Computer Press, 1997.

213INT3301: GAME PROGRAMMING

| 213INT3301 | GAME PROGRAMMING | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Python for Programming and Product Development (211CSE1401)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To know the mechanics and logic of Game design
- To train the students to acquire knowledge in game modeling techniques
- To acquire knowledge about the issues in game design
- To gain skill in game engine development.

**COURSE OUTCOMES:**

**CO1.** Have knowledge on the concepts and techniques used in Game design

**CO2.** Design and model interactive game.

**CO3.** Design and implement algorithms and techniques applied to Game design

**CO4.** Analyze the various Gaming platforms and Networks

**CO5.** Develop some gaming applications

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | | 2 | | | |
| CO2 | | 3 | | | 2 | |
| CO3 | 2 | | | 3 | | 1 |
| CO4 | 2 | | 1 | 2 | | 3 |
| CO5 | 3 | 2 | | | 3 | |

**COURSE TOPIC(S) :**

**UNIT 1: 3D GRAPHICS FOR GAME PROGRAMMING**

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation

**UNIT 2 : GAME DESIGN PRINCIPLES**

Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principlesof level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding **UNIT 3 : GAMING ENGINE DESIGN**

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

**UNIT 4: GAMING PLATFORMS AND FRAMEWORKS**

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, Unity

**UNIT 5: GAME DEVELOPMENT**

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

**TEXT BOOK**

1. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach toReal-Time Computer Graphics”Morgan Kaufmann, 2 Edition, 2006.
2. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC,1stedition, 2011.

**REFERENCES**

1. Mike Mc Shaffrfy, “Game Coding Complete”, Third Edition, Charles River Media,2009.
2. Jonathan S. Harbour, “Beginning Game Programming”, Course Technology PTR, 3edition, 2009.
3. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”.

213INT3302 : MULTIMEDIA AND COMPUTER GRAPHICS

| 213INT3302 | MULTIMEDIA AND COMPUTER GRAPHICS | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Python for Programming and Product Development (211CSE1401)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To understand computational development of graphics with mathematics
- To provide in-depth knowledge of display systems, image synthesis,shapemodeling of 3D application.
- To Understand basic concepts related to Multimedia including data standards, algorithms and software
- To Experience development of multimedia software by utilizing existinglibraries and descriptions of algorithms

**COURSE OUTCOMES:**

**CO1.** Understand the proficiency in 3D computer graphics API programming

**CO2.** Analyze the perspective of modern computer system with modeling, analysisand interpretation of 2D and 3D visual information

**CO3.** Understand different realizations of multimedia tools

**CO4.** Develop interactive animations using multimedia tools

**CO5.** Understand the knowledge of different media streams in multimedia transmission

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 3 | | | 2 | | |
| **CO3** | | 2 | 1 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO4** | | 3 | | | | |
| **CO5** | 1 | | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1 : MULTIMEDIA SYSTEMS DESIGN**

An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – objects used in Multimedia systems – Multimedia Data interfacestandards – Multimedia Databases

**UNIT 2 : MULTIMEDIA FILE HANDLING**

Compression & Decompression Algorithms– Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – video image and animation – Full motion video

– Storage and retrieval Technologies.

**UNIT 3: HYPERMEDIA**

Multimedia Authoring & User Interface – Multimedia Messaging - Hypermedia messaging – Hypermedia message component – creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems. **UNIT 4: OUTPUT PRIMITIVES**

Introduction - Line - Curve and Ellipse Algorithms – Attributes –Two-Dimensional

Geometric Transformations – Two-Dimensional Viewing.

**UNIT V : THREE-DIMENSIONAL CONCEPTS**

Three-Dimensional Object Representations – Three-Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation

**PRACTICAL EXPERIMENTS**

1. To implement Bresenham's algorithms for line, circle and ellipse drawing
2. To perform 2D Transformations such as translation, rotation, scaling, reflection andsharing.
3. To implement Cohen-Sutherland 2D clipping and window-view port mapping
4. To perform 3D Transformations such as translation, rotation and scaling.

5. To visualize projections of 3D images.
6. To convert between color models.
7. To implement RLE compression algorithm
8. To implement image compression algorithm
9. To perform animation using any Animation software.
10. To perform basic operations on image using any image editing software

**TEXT BOOKS**


1. Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2013.
2. Donald Hearn and M.Pauline Baker, "Computer Graphics C Version", PearsonEducation, 2009.


**REFERENCES**


1. Judith Jeffcoate, Multimedia in practice technology and Applications, PHI, 2007.
2. Foley, Vandam, Feiner, Huges, 'Computer Graphics:Principles & Practice', PearsonEducation, second edition 2003.

213INT3303: GRAPH THEORY

| 213INT3303 | GRAPH THEORY | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Structures and Algorithms (212INT2303)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- This course comprehends the graphs as a modeling and analysis tool in computer science & Engineering. It introduces the structures such as graphs & trees and techniques of counting and combinations, which are needed in number theory based computing and network security studies in Computer Science.

**COURSE OUTCOMES:**

**CO1.** Able to precise and accurate mathematical definitions of objects in graph theory.

**CO2.** Apply mathematical definitions to identify and construct examples

**CO3.** Able to Validate and critically assess a mathematical proof.

**CO4.** Analyze the use of combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.

**CO5** Identify the reason from definitions to construct mathematical proofs.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | |
| **CO2** | 2 | | | | | |
| **CO3** | 3 | 3 | | 2 | | |
| **CO4** | | | | 3 | | 2 |
| **CO5** | 3 | | | | 3 | |

**COURSE TOPIC(S) :**

**UNIT 1 INTRODUCTION**

Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits –Connectedness – Components – Euler graphs – Hamiltonian paths and circuits – Trees – Properties of trees – Distance and centers in tree – Rooted and binary trees.

**UNIT 2 TREES, CONNECTIVITY & PLANARITY**

Spanning trees – Fundamental circuits – Spanning trees in a weighted graph – cut sets – Propertiesof cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and geometricgraphs – Planergraphs – Different representation of a planer graph.

**UNIT 3 MATRICES, COLOURING AND DIRECTED GRAPH**

Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations–Directed paths and connectedness – Euler graphs.

**UNIT 4 PERMUTATIONS & COMBINATIONS**

Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.

**UNIT 5 GENERATING FUNCTIONS**

Generating functions - Partitions of integers - Exponential generating function – Summation operator - Recurrence relations - First order and second order – Non-homogeneous recurrence relations - Method of generating functions

**TEXT BOOK**

1. NarsinghDeo, Graph Theory: With Application to Engineering and Computer Science, Prentice Hall of India, 2003.
2. Grimaldi R.P., Discrete and Combinatorial Mathematics: An Applied Introduction, Addison Wesley, 1994.

**REFERENCES**


1. Clark J. & Holton D.A., A First Look at Graph Theory, Allied Publishers, 1995.
2. Mott J.L., Kandel A. & Baker T.P., Discrete Mathematics for Computer Scientists andMathematicians, Prentice Hall of India, 1996.
3. Liu C.L., Elements of Discrete Mathematics, McGraw Hill, 1985.
4. Rosen K.H., Discrete Mathematics And Its Applications, McGraw Hil, 2007

213INT3304: MACHINE LEARNING

| 213INT3304 | MACHINE LEARNING | L<br>2 | T<br>1 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Structures and Algorithms (212INT2303)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To introduce students to the basic concepts and techniques of MachineLearning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability based learning techniques
- To understand graphical models of machine learning algorithms

**COURSE OUTCOMES:**

**CO1.** Distinguish between, supervised, unsupervised and semi-supervised learning

**CO2.** Choose the appropriate machine learning strategy for any given problem

**CO3.** Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem

**CO4.** Design systems that use the appropriate graph models of machine learning

**C05.** Modify existing machine learning algorithms to improve classification efficiency

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| **CO\SO** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | |
| **CO2** | | 3 | | 2 | | |
| **CO3** | 2 | | | | | 3 |
| **CO4** | | | 1 | 3 | | 2 |
| **CO5** | 3 | 2 | | | | |

**COURSE TOPIC(S) :**

## UNIT 1 : INTRODUCTION

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 –LinearSeparability –Linear Regression

## UNIT 2: LINEAR MODELS

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 3 : TREE AND PROBABILISTIC MODELS

Learning with Trees –Decision Trees –Constructing Decision Trees –Classification and Regression Trees –Ensemble Learning –Boosting –Bagging –Different ways to Combine Classifiers –Probability and Learning –Data into Probabilities –Basic Statistics –Gaussian Mixture Models –Nearest Neighbor Methods –Unsupervised Learning –K means Algorithms – Vector Quantization –Self Organizing Feature Map

## UNIT 4: DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS

Dimensionality Reduction –Linear Discriminant Analysis –Principal Component Analysis –Factor Analysis –Independent Component Analysis –Locally Linear Embedding – Isomap –LeastSquares Optimization –Evolutionary Learning –Genetic algorithms – Genetic Offspring: -GeneticOperators –Using Genetic Algorithms –Reinforcement Learning –Overview –Getting Lost Example – Markov Decision Process

## UNIT 5: GRAPHICAL MODELS

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

**TEXTBOOKS:**

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

213INT3305 : ADVANCED DBMS

| **213INT3305** | **ADVANCED DBMS** | **L** | **T** | **P** | **X** | **C** | **H** |
|---|---|---|---|---|---|---|---|
| | | **3** | **0** | **2** | **0** | **4** | **5** |
| Prerequisite: Information Storage, Modelling and Retrieval (212INT2306)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- Learn different types of databases.
- Be exposed to query languages.
- Be familiar with the indexing techniques.

**COURSE OUTCOMES:**

**CO1.** To understand the underlying principles of Relational Database Management System.

**CO2.** To understand and implement the advanced features of DBMS.

**CO3.** To develop database models using distributed databases.

**CO4.** To Understand the Query Processing

**CO5.** To implement and maintain an efficient database system using emergingtrends

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | | 3 | | | | |
| **CO3** | 2 | | | | | 3 |
| **CO4** | | | | | | 2 |
| **CO5** | 3 | | | | | |

**COURSE TOPIC(S) :**

**UNIT1: PARALLEL AND DISTRIBUTED DATABASES**

Inter and Intra Query Parallelism – Architecture – Query evaluation – Optimization – Distributed Architecture – Storage – Catalog Management – Query Processing – Transactions

– Recovery – Large-scale Data Analytics in the Internet Context – Map Reduce Paradigm – run-time system for supporting scalable and fault-tolerant execution – paradigms: Pig Latin and Hive and parallel databases versus Map Reduce. Practical: DDL, DML, TCL commands

**UNIT 2: ACTIVE DATABASES**

Syntax and Sematics (Starburst, Oracle, DB2) – Taxonomy – Applications – Integrity Management – Workflow Management – Business Rules – Design Principles – Properties – RuleModularization – Rule Debugging – IDEA methodology – Open Problems. Practical: DB2 AULibrary.com

**UNIT3: TEMPORALANDOBJECTsDATABASES**

Overview – Data types – Associating Facts – Temporal Query Language – TSQL2 – Time Ontology – Language Constructs – Architecture – Temporal Support – Object Database and Change Management – Change of Schema – Implementing Database Updates in O2 – Benchmark Database Updates – Performance Evaluation. Practical: SQL

**UNIT 4: COMPLEX QUERIES AND REASONING**

Logic of Query Languages – Relational Calculi – Recursive rules – Syntax and semantics of Data log – Fix point semantics – Implementation Rules and Recursion – Rule rewriting methods – Compilation and Optimization – Recursive Queries in SQL – Open issues. Practical: SQL

**UNIT 5: SPATIAL, TEXT AND MULTIMEDIA DATABASES**

Traditional Indexing Methods (Secondary Keys, Spatial Access Methods) – Text Retrieval

– Multimedia Indexing – 1D Time Series – 2d Color images – Sub pattern Matching – Open Issues – Uncertainties. Practical: SQL Programs

**TEXT BOOK:**

1. Raghu Ramakrishnan "Database Management System", Mc Graw Hill Publications,McgrawHillPublications, 2014 reprint.

**REFERENCES:**


1. Carlo Zaniolo, Stefano Ceri "Advanced Database Systems", Morgan KauffmannPublishers. 2007
2. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts",Sixth Edition, Tata McGraw Hill, 2011

213INT3306 : INFORMATION STORAGE MANAGEMENT

<table>
<tr><td rowspan="2">213INT3306</td><td rowspan="2">INFORMATION STORAGE MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>0</td><td>4</td><td>5</td></tr>
<tr><td colspan="8">Prerequisite: Information Storage, Modelling and Retrieval (212INT2306)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- Understand Storage Area Networks characteristics and components.
- Describe the challenges associated with data center networking and the needfor switch network convergence.
- Storage Area Networks including storage architectures, logical and physicalcomponents of a storage infrastructure, managing and monitoring the data center.
- Describe the business continuity and disaster recovery in a storage infrastructure.
- Describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
- Identify key areas to monitor in a data center for different components ina storage

**COURSE OUTCOMES:**

**CO1.** Identify and describe the functions to build data center networking for switch network

**CO2.** Discuss different types of logical and physical components of a storage infrastructure

**CO3.** Understand the importance of fiber Channel protocols and how to communicate with each other and the benefits of the different networkstorage options for different application environments

**CO4.** Identify single points of failure in a storage infrastructure and list solutions

**CO5.** Identify and analyzes the common threats in each domain

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | | 3 | | 1 | | 2 |
| **CO3** | 2 | | | | | 3 |
| **CO4** | 3 | | 1 | 3 | | |
| **CO5** | 2 | | | 2 | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1 : INTRODUCTION TO STORAGE TECHNOLOGY**

Review data creation and the amount of data being created and understand the value of data to a business - challenges in data storage and data management - Solutions available or data storage - Core elements of a data center infrastructure - role of each element in supporting business activities.

**UNIT 2 : STORAGE SYSTEMS ARCHITECTURE**

Hardware and software components of the host environment - Key protocols and concepts used by each component - Physical and logical components of a connectivity environment Major physical disk - access characteristics - and performance implications - Concept of RAID and its components - Different Raid levels and their suitability for different application environments: RAID 0 RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6- Compare and contrast integrated and modular storage systems - High-level architecture and working of an intelligent storage system.

**UNIT 3 : INTRODUCTION TO NETWORKED STORAGE**

Evolution of networked storage – Architecture – Components - and topologies of FC-SAN, NAS, and IP-SA Benefits of the different networked storage options -Understand the need for long- term archiving solutions and describe how CAS fulfills the need - Understand the appropriateness of the different networked storage options for different application environments.

**UNIT 4: INFORMATION AVAILABILITY & MONITORING & MANAGING DATA CENTER**

List reasons for planned/unplanned outages and the impact of downtime - impact of downtime-Differentiate between business continuity (BC) and disaster recovery (DR) - RTO and RPO-Identify single points of failure in a storage infrastructure and list solution sto mitigate these failures - Architecture of backup/recovery and the different backup/recovery topologies - replication technologies and their role in ensuring information availability and business continuity - Remote replication technologies and their role in providing disaster recovery and business continuity capabilities - Identify key areas to monitor in a data center - Industry standards for data center monitoring and management - key metrics to monitor for different components in a storage infrastructure - key management tasks in a data center.

**UNIT 5: SECURING STORAGE AND STORAGE VIRTUALIZATION**

Information security - Critical security attributes for information systems - Storage security domains - List and analyzes the common threats in each domain - Virtualization technologies –block-level and file-level virtualization technologies and Processes

**TEXT BOOK**

1. EMC, EMC Education Services, Lastemc, “Information Storage and Management: Storing, Managing, and Protecting Digital Information”, John Wiley and Sons, 2nd edition, 2012.

**REFERENCES**

1. Robert Spalding, “Storage Networks: The Complete Reference”. Tata McGraw Hill, Osborne, 2003
2. Marc Farley, “Building Storage Networks”, 2nd Edition, Tata McGraw Hill, Osborne, 2001.
3. Meeta Gupta, “Storage Area Network Fundamentals”, Pearson Education Limited,2002

213INT3307: BLUETOOTH TECHNOLOGY

| 213INT3307 | BLUETOOTH TECHNOLOGY | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To Understand Bluetooth's standards, architecture and operation.
- To Understand the APIs, radio interface and protocol layers used byBluetooth.
- To Configure Bluetooth-enabled devices including mobile phones, PDAsand Access Points.
- To Install and configure Bluetooth hardware and software.
- To Configure LAN access, remote access and FAX gateway access point solutions using Bluetooth

**COURSE OUTCOMES:**

**CO1.** Demonstrate the students about how Bluetooth devices pair set up and the options concerning discoverability

**CO2.** Analyze the various kinds of data transfer between Bluetooth devices

**CO3.** Create trust and security related policies which are handled by Bluetooth.

**CO4.** Implement profiles like the Headset profile, LAN, OBEX, and Serial port compatible to specified applications.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | | |
| **CO2** | 3 | | | | | |
| **CO3** | | | 1 | 2 | | |
| **CO4** | 2 | | | 3 | | 3 |
| **CO5** | 3 | 2 | | | | |

**COURSE TOPIC(S) :**

**UNIT 1: BASIC CONCEPTS**

Components-networks-Topologies-Protocols and Standards –ISO/OSI model-Origin- blue tooth SIG - Protocol stack - Security applications and profiles – management - test and qualification technology basics - RF and IR wireless communication.

**UNIT 2: BLUETOOTH MODULE**

Antennas patterns - gain and losses- types of antennas- on chip antennas radio interference - FH,modulation, symbol timing, power emission and control, performance parameters - RF architecture - Blur RF - Base band - Blue tooth device address system timing - Physical links-packet structuring types and construction - channel coding and time base synchronization.

**UNIT 3 : LINK CONTROLLER AND MANAGEMENT**

LCP- controller states - Pico net and scattered operations - Master / slave role switching LC Architectural overview – LMC - Link set up - Quality of service - LMP version - Name represent-Test mode.

**UNIT 4 : BLUETOOTH HOST**

LLC and adaptation protocol L2 cap signaling – connections- Blue tooth profiles- Version

1.0-Generic profiles-serial and object exchange.

**UNIT 5: SECURITY**

Encryption and security Key generation - security Modes and architecture - Low power operation and QOS management.

**TEXTBOOKS**

Jennifer, Sturman, “Bluetooth Connect without cables”,education 2005.

**REFERENCES**

1. Brent A.Miller and Bisdikian C,”Bluetooth reveeled”,2nd Edition,Pearson Education 2002.
2. Muller J, “Blue tooth Demystified”, Nathan Tata Mc Graw Hill 2001

213INT3308: WIRELESS SENSOR NETWORKS

| 213INT3308 | WIRELESS SENSOR NETWORKS | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To teach the general principles of wireless sensor networks, and the state of theart in information processing in wireless sensor networks.

**COURSE OUTCOMES:**

**CO1.** Demonstrate familiarity with common wireless sensor node architectures

**CO2.** Illustrate knowledge of MAC and routing protocols developed for WSN

**CO3.** Emphasize the importance of time synchronization and localization of WSN

**CO4.** Interpret the operating system developed for WSN

**CO5** Identify the suitable topology for WSN

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 2 | 3 | | | | 3 |
| **CO3** | | | | | | |
| **CO4** | 3 | 2 | 1 | | 3 | 2 |
| **CO5** | 1 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1 :INTRODUCTION AND OVERVIEW OF WIRELESS SENSOR NETWORKS**

Introduction - Basic overview of the technology - Range of applications - Examples of category1 and 2 WSN application - Sensor node technology - Sensor taxonomy - WN node operating environment – WN Trends - Wireless Transmission Technology and Systems – Applications of Wireless Sensor Network

**UNIT 2:POWER MANAGEMENT AND ROUTING IN WSN**

Distributed Power – Aware micro sensor networks - Dynamic voltage scaling techniques – Operating system for energy Scalable in WSN - Dynamic power management -Energy aware routing - Altruists or Friendly neighbours in the Pico radio sensor network - Aggregate queries - Bluetooth in the distributed sensor network - Mobile networking for smart dust

**UNIT 3 :CLUSTERING AND SECURITY PROTOCOLS IN WSN**

Topology discovery and clusters in sensor networks - Adaptive clustering with deterministic Cluster – Head selection -Sensor cluster's performance - Power – aware functions -Efficient flooding with passive Clustering -Security protocols in sensor networks - Communication security

**UNIT 4: NETWORK MANAGEMENT AND OPERATING SYSTEM**

Network management requirements - Traditional network management models – Network management design issues – MANNA - other issues related to network management - Operating system design issues – TinyOS – Mate – MagnetOS – MANTIS – OSPM - EYES OS – SenOS – EMERALDS – PicsOS - WSN design issues -Performance modeling - Case study: Simple computation of the System Life Span. WSN Network architecture: typical network architectures- data relaying and aggregation strategies

**UNIT 5 : TOPOLOGY CONTROL**

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN.Topology Control - Distributed Topology Control- Design Guidelines -Ideal Features of a Topology Control Protocol .The Quality of Information - Logical and Physical Node Degrees ; Location-based Topology Control, Localization- Absolute and relative localization. Neighbor-based Topology Control -

The Number of Neighbors for Connectivity - The KNeigh Protocol - The XTC Protocol; Dealing with Node Mobility

**TEXT BOOKS**


1. 1.KazemSohraby, Daniel Minoli, TaiebZnati, “Wireless Sensor Networks Technology - Protocols and Applications”, John Wiley & Sons, Ltd, 2007.
2. 2.Anna Hac, “Wireless Sensor Network Designs”, John Wiley & Sons, Ltd, 2003.
3. 3.Paolo Santi, “Topology Control in Wireless Ad Hoc and Sensor Networks”, John Wiley & Sons, Ltd, 2005.


**REFERENCES**


1. 1.Andreas Willing, “Protocols and Architecture for Wireless Sensor Networks”, , John Wiley & Sons Ltd., 2005.
2. 2.Ian F. Akyildiz and Mehmet Can, “Wireless Sensor Networks”, John Wiley & Sons Ltd., 2010.
3. 3.Mohammad Ilyas and ImadMahgoub, “Handbook of sensor networks : Compact wireless and wired sensing systems”, CRC Press LLC, 2005.

213INT3309: INDUSTRIAL IOT

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **213INT3309** | **INDUSTRIAL IOT** | **2** | **0** | **2** | **0** | **4** | **5** |
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn about the fundamentals of Internet of Things
- To build a small low cost embedded system using Arduino/ Raspberry Pi or equivalent boards
- To apply the concept of Internet of Things in real world scenario

**COURSE OUTCOMES:**

**CO1.** Design a portable IoT using Arduino/Equivalent boards and relevant protocols

**CO2.** Develop web services to access/control IoT devices

**CO3.** Analyze the various components of IoT

**CO4.** Analyze applications of IoT in real time scenario

**CO5** Deploy an IoT application and connect to the cloud

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | | 3 | 1 | | | 2 |
| **CO3** | | | | 3 | | |
| **CO4** | 3 | 2 | 2 | | | |
| **CO5** | 3 | | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT I INTRODUCTION**

IIoT-Introduction, Industrial IoT: Business Model and RefereceArchiterture: IIoT-Business Models, Industrial IoT- Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking.

**UNIT II IIOT ANALYTICS**

Big Data Analytics and Software Defined Networks, Machine Learning and Data Science, JuliaProgramming, Data Management with Hadoop.

**UNIT III IIOT SECURITY**

Industrial IoT: Security and Fog Computing - Cloud Computing in IIoT, Fog Computing inIoT, Security in IoT.

**UNIT IV ROBOTICS**

Sensor Categories, Binary Sensor, Analog versus Digital Sensors, Shaft Encoder; A/D Converter, Position Sensitive Device; Compass, Gyroscope, Accelerometer, Inclinometer, Digital Camera.

**UNIT V CASE STUDY**

Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies : Milk Processing and Packaging Industries, Manufacturing Industries.

**TEXT BOOKS**

1. 1.Industry 4.0: The Industrial Internet of Things", by Alasdair Gilchrist (Apress), 2017.
2. 2.AnisKoubaa, "Robot Operating System (ROS) The Complete Reference", First Volume, Springer, 2016

**REFERENCE BOOKS**

1. 1."Industrial Internet of Things: CybermanufacturingSystems"by Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer), 2017
2. 2.Hands-On Industrial Internet of Things: Create a powerful Industrial IoT by Giacomo Veneri, Antonio Capasso, Packt, 2018.

213INT3310: NETWORK DESIGN SECURITY AND MANAGEMENT

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **213INT3310** | **NETWORK DESIGN SECURITY AND MANAGEMENT** | **3** | **0** | **2** | **0** | **4** | **5** |
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To know about System Level Security, Vulnerabilities & threats
- To understand the concepts of Encryption Algorithms & Techniques, Authentication functions, Protocols & Tools,
- To analyze the Security principles based on OSI Architecture, Wireless Security, Network design including LAN and WAN & Network Management

**COURSE OUTCOMES:**

**CO1.** Understand the basic concepts of network design

**CO2.** Illustrate the process of network design

**CO3.** Apply authentication techniques to provide secure communication

**CO4.** Analyze public cryptosystems for the quality of security

**CO5** Understand the concepts of various Network Management Services

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| **CO\SO** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | | 3 | | 1 | | |
| **CO3** | 2 | | | | | 3 |
| **CO4** | | | 1 | 3 | | |
| **CO5** | 1 | | | | 2 | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

Overview of Design process - Process Components, System description, Service Description, Service, Performance Characteristics, Network Supportability. Requirement Analysis – User requirement, Application requirement, Device requirement, Network requirement.

**UNIT 2: DESIGN CONCEPTS**

Design Concepts – Objectives, process, Service provider Evaluation, Network Layout, Trace Traceability, Design Metrics.

**UNIT 3: SECURITY PROBLEM AND CRYPTOGRAPHY**

Security attacks – services – and mechanism – Conventional encryption model – Steganography-classical encryption techniques – simplified DES – block Cipher principles – TDESstandards-Principles of Public key cryptosystems – RSA algorithm – Key management – hellman key exchange – Authentication requirements and functions – Authentication codes Hash functions Kerberos. Practical: DES, RSA, Hellman algorithms

**UNIT 4: NETWORK SECURITY**

Transport level Security- Web Security, SSL, TLS, HTTPS, SSH- Wireless network security-E Mail security-PGP, S/ MIME, DKIM, IP Security, Intrusion detection – password management. Malicious software– Viruses and related Threats – Virus Counter measures , worms, DDoS attacks– Firewall Design Principles – Trusted Systems. Practical: PGP, S/ MIME, DKIM

**UNIT 5: NETWORK MANAGEMENT**

Network management – requirements and systems – Network monitoring architecture – Performance monitoring – Fault monitoring – Account monitoring – Configuration control – Security control – SNMP background and concepts – structure of management information – SNMP protocol – Basic concepts – specifications – Transport level support Groups. Practical: Network Monitoring.

**TEXT BOOKS**

1. "Network Analysis, Architecture, and Design" (3rd Edition), James McCabe, Morgan Kaufmann Publishers, 3rd edition, 2011
2. William Stallings, "Cryptography and Network Security", 6th Edition, PearsonEducation, March 2013.

3. William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON 1 and 2", Pearson education Asia, 2009.

**REFERENCES**

1. Charles P. Pfleeger, "Security in Computing", Prentice Hall, 3rd Edition 2003.
2. Bruce Schneier, "Applied Cryptography", JohnWiley& Sons Inc, 2nd edition, 2007.
3. Mani Subramanian, "Network management – Principle and practice", Pearson education India, 2010.

213INT3311: MOBILE NETWORKS

<table>
<tr><td rowspan="2">213INT3311</td><td rowspan="2">MOBILE NETWORKS</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>0</td><td>4</td><td>5</td></tr>
<tr><td colspan="8">Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- This Course Describes about routing mechanisms for both Adhoc and SensorNetworks

**COURSE OUTCOMES:**

**CO1.** Understand the basics of radio access and networks

**CO2.** Learn to simulate wireless networks and analyze the simulation results

**CO3.** Describe the concepts of ad hoc networks, design and implementation issues,and available solutions

**CO4.** Apply knowledge of wireless sensor networks to various application areas

**CO5** Demonstrate advanced knowledge of networking and wireless networking

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| **CO\SO** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | | | | |
| **CO2** | 3 | 3 | | | | 2 |
| **CO3** | | | | | | 3 |
| **CO4** | 3 | | | | 2 | |
| **CO5** | 2 | | | | | |

**COURSE TOPIC(S) :**

**UNIT 1: MULTIPLE RADIO ACCESS**

Medium Access Alternatives: Fixed-Assignment for Voice Oriented Networks Random Access for Data Oriented Networks, Handoff and Roaming Support, Security and Privacy.

**UNIT 2: WIRELESS BROADBAND NETWORKS TECHNOLOGY &PLATFORMS**

Wireless broadband fundamentals and Fixed Wireless Broadband Systems - Platforms- Enhanced Copper- Fibre Optic and HFC - 3G Cellular- Satellites - ATM and Relay Technologies

**UNIT 3: AD HOC NETWORKS**

Characteristics and Applications of Ad hoc Networks - Routing – Need for routing and routing classifications - Table Driven Routing Protocols - Source Initiated On-Demand Routing Protocols - Hybrid Protocols – Zone Routing - Fisheye Routing - LANMAR for MANET with groupmobility - Location Added Routing, Distance Routing Effects - Micro discovery and Power Aware Routing. Practical : Routing Protocols

**UNIT 4: SENSOR NETWORKS**

Wireless Sensor Networks - DARPA Efforts –Classification - Fundamentals of MAC - Flat routing-Directed Diffusion-SPIN - COGUR - Hierarchical Routing - Cluster base routing - Scalable Coordination – LEACH – TEEN - APTEEN and Adapting to the dynamic nature of Wireless Sensor Networks.

Practical : MAC protocols

**UNIT 5: ADVANCED WIRELESS NETWORKS**

Key Management in Sensor Network, Intrusion detection in sensor Networks, Security in RFID devices, Security in Adhoc Networks, Human – centered cyber security

**TEXT BOOKS**

1. John R. Vacca, “Wireless Broadband Networks Handbook 3G, LMDS and WirelessInternet”, Tata McGraw-Hill, 2001.

## REFERENCES

1. Agrawal D.P., and Qing-Anzeng, “Introduction to Wireless and Mobile Systems”,Thomson Learning, 3$^{rd}$ Edition, 2010.
2. Martyn Mallick, “Mobile and Wireless Design Essentials, Wiley publication, 2003.
3. KaveshPahlavan and Prashant Krishnamurty, “Principles of Wireless Networks – Aunified Approach”, Prentice Hall PTR, 2002

213INT3312: HIGH PERFORMANCE NETWORKS

| 213INT3312 | HIGH PERFORMANCE NETWORKS | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To facilitate the students on the basis of ATM and Frame relay concepts andexplain the various types of LAN's and to know about their applications.
- To learn about network security in many layers and network management
- To study the types of VPN and tunneling protocols for security.
- To develop a comprehensive understanding of multimedia networking.

**COURSE OUTCOMES:**

**CO1.** Implement different operations in communication networks

**CO2.** Understand the flow control and congestion control during packet transmission

**CO3.** Understand switching in ATM and Frame Relay networks

**CO4.** Study about the differnet queuing methods

**CO5** Know the different protocols towards Quality of Service

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 2 | 3 | | | | |
| **CO3** | | | | | | 3 |
| **CO4** | | 2 | 1 | | | |
| **CO5** | 3 | | | 2 | | |

**COURSE TOPIC(S) :**

**UNIT 1: HIGH SPEED NETWORKS**

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logicalConnection, ATM Cell – ATM Service Categories – AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11

**UNIT 2: CONGESTION AND TRAFFIC MANAGEMENT**

Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

**UNIT 3: TCP AND ATM CONGESTION CONTROL**

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN’s Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

**UNIT 4: INTEGRATED AND DIFFERENTIATED SERVICES**

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

**UNIT 5: PROTOCOLS FOR QOS SUPPORT**

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

**TEXT BOOK**

1. William Stallings, “High Speed Networks And Internet”, Pearson Education, SecondEdition, 2010.

**REFERENCES**


1. Warland&PravinVaraiya, “High Performance Communication Networks”, Jean HarcourtAsia Pvt. Ltd., II Edition, 2001.

2. IrvanPepelnjk, Jim Guichard and Jeff Apcar, “MPLS and VPN Architecture”, Cisco Press, Volume 1 and 2, 2003.

213INT3313: CRYPTOGRAPHY AND NETWORK SECURITY

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **213INT3313** | **CRYPTOGRAPHY AND NETWORK SECURITY** | **3** | **0** | **2** | **0** | **4** | **5** |
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To develop a fundamental understanding of Cryptography and network security proper practices, policies, technologies and standards.

**COURSE OUTCOMES:**

**CO1.** Explain the foundations of cryptography and network security.

**CO2.** Identify common security vulnerability attacks in different networkingenvironment

**CO3.** Evaluate the risks and threats to digital communication system

**CO4.** Demonstrate the detailed knowledge of the role of encryption to protect the data

**CO5** Explain the fundamental concepts of different digital signature schemes

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | |
| **CO2** | | 3 | | | | |
| **CO3** | 2 | | | 2 | | |
| **CO4** | 3 | | | 3 | | 2 |
| **CO5** | 3 | | 3 | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

Introduction-OSI Security Architecture - Classical Encryption techniques – Block Cipher

Principles –

Data Encryption Standard- Basic concepts in number theory and finite fields – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES. Practical: DES

**UNIT 2: PUBLIC KEY CRYPTOGRAPHY**

Number Theory- Public Key Cryptography and RSA-Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography –Public Key Cryptosystem-Confidentiality using Symmetric Encryption and Asymmetric Encryption. Practical: RSA, Diffie Hellman

**UNIT 3: CRYPTOGRAPHIC AND DATA INTEGRITY ALGORITHMS**

Applications of cryptographic hash functions- Simple Hash Functions- Requirements and security-Secured Hash Algorithm- Message Authentication requirements and functions – Message Authentication Codes – Security of MACs – HMAC- Digital Signatures – ElGamal Digital signature scheme- Schnorr Digital signature scheme - Digital Signature Standard. Practical: Secured Hash Algorithm- Cryptography and Authentication

**UNIT 4: NETWORK AND INTERNET SECURITY**

Transport level Security- Web Security, SSL, TLS, HTTPS, SSH- System Implementation- Wireless network security-E Mail security-PGP, S/ MIME, DKIM, IP Security. Practical: PGP**UNIT 5: SYSTEM LEVEL SECURITY**

Intrusion detection – password management. Malicious software– Viruses and related Threats – Virus Counter measures , worms, DDoS attacks– Firewall Design Principles – Network Security-Trusted Systems. Practical: password management

**TEXT BOOK**

1. William Stallings, “Cryptography and Network Security”, 6th Edition, PearsonEducation, March 2013.

**REFERENCES**


1. Bruce Schneier, “Applied Cryptography”, second edition, John Wiley & Sons, New York, 2007.
2. Chris Brenton, “Mastering Network Security”, BPB Publication, New Delhi, 2002.
3. Behrouz A Forouzan , “Cryptography and Network Security”, Tata McGraw HillEducation Pvt. Ltd., New Delhi, 2014.

213INT3314: CLOUD COMPUTING

| 213INT3314 | CLOUD COMPUTING | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 4 | 5 |

Prerequisite: Data Communications and Computer Networks (212INT3301)

Course Category: Professional Electives

CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

- To impart fundamental concepts in the area of cloud computing.
- To impart knowledge in developing applications of cloud computing proofs for computation and algorithms.

**COURSE OUTCOMES:**

**CO1.** Understanding the systems, protocols and mechanisms to support cloud computing

**CO2.** Develop applications for cloud computing

**CO3.** Understanding the hardware necessary for cloud computing

**CO4.** Design and implement a novel cloud computing application

**CO5** Knowledge in various Cloud vendors and their products

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | 2 |
| **CO2** | | 3 | | | | |
| **CO3** | 2 | | | 1 | | |
| **CO4** | | 3 | | | 2 | |
| **CO5** | 3 | | | | | 2 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

Overview – applications - intranet and cloud - examples: Amazon, Google, Microsoft, IBM – Benefits and Limitations of cloud computing - Google app engine – EMC - NETAPP - MicrosoftAzure - Amazon(EC2, S3,SQS) - open stack -cloud computing services

**UNIT 2: HARDWARE AND ARCHITECTURE**

Clients-Security-Network-Services. Accessing the cloud: Platforms-web applications-web APIs- web browsers. Cloud storage: overview-providers. Standards: application-client-infrastructure- service.

**UNIT 3: SOFTWARE AS SERVICE**

Overview- Driving forces-company offerings-industries. Software plus services: Overview-mobile device integration-providers-Microsoft Online.

**UNIT 4: DEVELOPING APPLICATIONS**

Google – Microsoft – IntuitQuickBase - Cast Iron Cloud - Bungee Connect –Development (App engine, Azure, open stack etc.) - trouble shooting and application management.

**UNIT 5: LOCAL CLOUDS AND THIN CLIENTS**

Virtualization-server solutions-thin clients. Cloud Migration: cloud services for individuals-enterprise cloud- methods for migration-analyzing cloud services.

**TEXT BOOKS**


1. Anthony T.Velte, Toby Velte, "Cloud Computing a practical approach", Mcgraw Hill,2010.
2. M.S.V.Janakiram, "Demystifying the Cloud – An introduction to Cloud Computing", version 1.1, 2010.


**REFERENCE BOOKS**


1. Mark C. Chu-Carroll, "Code in the Cloud- Programming Google App Engine", ThePragmatic Bookshelf Raleigh, North Carolina Dallas, Texas, 2011.
2. Breslin "Cloud Computing: Principles and Paradigms", Wiley Press, New York, USA, 2008

213INT3315: GREEN COMPUTING

| 213INT3315 | GREEN COMPUTING | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

## COURSE OBJECTIVES:

This course covers fundamental principles of energy management faced by designers of hardware, operating systems, and data centers. We will explore basic energy management option in individual components such as CPUs, networkinterfaces, hard drives, memory. We will further present the energy management policies at the operating system level that consider performance vs. energy saving tradeoffs. Finally we will consider large scale data centers where energy management is done at multiple layers from individual components in the system toshutting down entries subset of machines. We will also discuss energy generation and delivery and well as cooling issues in large data centers

## COURSE OUTCOMES:

**CO1.** Understand the concepts of technologies that conform to low-power computation

**CO2.** Understand green (power-efficient) technologies for components of one single computer, such as CPU, memory and disk, and appreciate cutting edge designs forthese components including memory and Registers

**CO3.** Have a basic understanding of a variety of technologies applied in building a green system (especially green data centers), including networks, Virtual Machine (VM) management and storage systems

**CO4.** Use a range of tools to help monitor and design green systems

**CO5** Analyze the various tools to greening the organization

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | |
| **CO2** | 2 | 3 | | | | |
| **CO3** | | | 1 | 3 | | |
| **CO4** | 2 | 2 | | | 3 | |
| **CO5** | 3 | | | | | 2 |

**COURSE TOPIC(S) :**

**UNIT 1:ION**

Inroduction - Need for Green Computing – Green computing Background – Understanding the World of Green IT: Win-Win-Winning with Green IT – Making the Business Case of Green IT –Green Journeys in Action.

**UNIT 2: GETTING A RUNNING START**

Getting to know the Standards and Metrics – Assessing your current Energy use and Needs – Go Green in 12 months: Putting Together a plan – Techniques for managing Power consumption

**UNIT 3: GREENING THE DATA CENTER**

Laying the foundation for green data management – maximizing data center efficiency – Bottom up Electrical Efficiency Improvement - Racking up green servers – cooling your data center – Building a Green Storage System – Grooming the Network for green – Using Virtualization – computer power using Benchmarking – Evaluation of Power Benchmarks

**UNIT 4: GREENING THE OFFICE**

Moving to Green Screens and Computing Machines – Reducing Desktop Energy Waste – Pursuing the Less-Paper Office – Evaluation Green Gadgetry – Experimental methodology

**UNIT 5: GREENING THE ORGANIZATION**

Greening the Facility – e-Waste Not, e-Want Not – Virtually There: Collobration Technologies for a Greener World - Ten Organizations that can help with Green IT objectives – Ten creative computer Recycling Tips – Ten tips for a Green Home Office.

**TEXT BOOKS**

1. Carol Baroudi , Jeffery Hill , Arnold Reinhold , JhanaSenxian, “ Green IT for dummies”, Wiley Publishing Inc, 2009.

**REFERENCE BOOKS**

MujtabaTalebi, “Computer Power Consumption benchmarking for green computing”, ceangage learning, April 2008.

213INT3316: MOBILE COMMUNICATION AND COMPUTING

| 213INT3316 | MOBILE COMMUNICATION AND COMPUTING | L<br>3 | T<br>0 | P<br>2 | X<br>0 | C<br>4 | H<br>5 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn the fundamental concepts of mobile communication and mobilecomputing.
- To analyze about internet protocols, its issues while dealing with mobilecomputing.
- To make students to understand about various communication systemssuch as GSM,GPRS etc.,
- To learn the basic concepts of adhoc networks and analyze the issuesinvolved in it.
- To design and implement mobile applications in different kinds of operating systems

**COURSE OUTCOMES:**

**CO1.** Understand the basic concepts of mobile computing

**CO2.** Analyze about internet protocol and Mobile internet protocol.

**CO3.** Learn about the different kinds of mobile telecommunication system.

**CO4.** Analyze the issues involved in adhoc networks and learn the various kinds of adhoc networks.

**CO5.** Identify, design and implement mobile applications in various platforms.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | |
| **CO2** | 2 | 3 | | 3 | | 2 |
| **CO3** | | 3 | | | | |
| **CO4** | 3 | | 2 | 3 | | |
| **CO5** | 2 | 2 | | | 3 | |

**COURSE TOPIC(S) :**

**UNIT 1 : INTRODUCTION**

Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes. Practical: MAC Protocols

**UNIT 2: MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER**

Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window – Improvement in TCP Performance. Practical: Key Distribution mechanisms.

**UNIT 3 : MOBILE TELECOMMUNICATION SYSTEM**

Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS). Practical: GSM Technique

**UNIT 4 : MOBILE AD-HOC NETWORKS**

Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks ( VANET) – MANET Vs VANET – Security. Practical: Routing Protocols

**UNIT 5: MOBILE PLATFORMS AND APPLICATIONS**

Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone-M-Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues. Practical: Security Mechanisms

**TEXT BOOK**

1. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi – 2012.

**REFERENCES**


1. Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007.
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobilesystems", Thomson Asia Pvt Ltd, 2005.
3. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles ofMobile Computing", Springer, 2003.

213INT3101: WIRELESS APPLICATION PROTOCOL

| 213INT3101 | WIRELESS APPLICATION PROTOCOL | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Professional Electives<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn the basic concepts of mobile internet
- To introduce the web technologies for developing simple web applications.
- To make students to understand about services of WAP and to learn WAP programming languages used for WAP service implementation.
- To teach the concepts for deploying WAP services
- To understand about wireless telephony applications and its enhancements

**COURSE OUTCOMES:**

**CO1.** Understand the basic concepts of mobile internet , services and service providersof mobile internet.

**CO2.** Learn about the web technologies used for developing web applications and components.

**CO3.** Analyze about the WAP services and to learn programming language used for developing WAP services.

**CO4.** Analyzing how WAP services are linked with internet and about internet protocols.

**CO5** Learn about wireless telephony applications, design consideration for applications.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | | | |
| CO2 | 3 | 2 | | 3 | | |
| CO3 | | | 1 | | | 3 |
| CO4 | 2 | | 1 | | | |
| CO5 | 3 | | | | 2 | |

**COURSE TOPIC(S) :**

**UNIT 1: MOBILE INTERNET**

Introduction, Mobile Data – connectivity – Key services for mobile internet – Mobile Internetaccess and application service provides - Content providers and Developer.

**UNIT 2: MOBILE INTERNET STANDARD**

Current Web technologies for wireless application - origin and overview of WAP components ofwap standard - Network Infrastructure services supporting Wap clients Design Principles Tools and software editors and emulators.

**UNIT 3: IMPLEMENTING WAP SERVICES**

WML Basic and Document model - content generation - Binary WML - enhanced WML - WMLscript - rules of script standard libraries - user interface design guidelines.

**UNIT 4: ADVANCED WAP**

Tailoring content to client - Techniques using HTTP 1.1 - WAP Push - Push Access Protocol -Push Technology - MIME media types for push messages - Proxy gateway; Data base driven WAP-ASP and WAP - Object model - Activex data objects (ADO) - End-to-End WAP services-Security domains - linking WAP and internet.

**UNIT 5: WIRELESS TELEPHONY APPLICATIONS**

WTA architecture - client Framework - Server and security - Design considerations Application creation Toolbox - WTA enhancements – Technology - Bluetooth and voice XML - Telematics inter connectivity.

**TEXT BOOKS**

1. Sandeep Signal et al, “Writing Applications for Mobile Internet”, Pearson Education,2001.

**REFERENCES**

1. “Wireless Protocols - A beginner’s Guide” BulBrook, Tata McGraw Hill PCL, 2001.

213INT3103: SOCIAL NETWORK ANALYSIS

| 213INT3103 | SOCIAL NETWORK ANALYSIS | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Information Storage, Modelling and Retrieval (212INT2306)<br>Course Category: Professional Electives<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To gain knowledge about social networks, its structure and socialnetwork data sources
- To learn the analysis and mining techniques for Social networks
- To study about the semantic technologies for social network analysis
- To gain knowledge on Visualization of Social networks and its applications

**COURSE OUTCOMES:**

**CO1.** Learn current web developments in Social Web

**CO2.** Understand various mining techniques for social networks

**CO3.** Model and represent knowledge for Semantic Web

**CO4.** Design extraction and mining tools for Social networks

**CO5** Develop personalized visualization for Social networks

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | 3 |
| **CO2** | 2 | 3 | | | | |
| **CO3** | | | 1 | 3 | | |
| **CO4** | 2 | 2 | | | 3 | |
| **CO5** | 3 | | | | | 2 |

**COURSE TOPIC(S) :**

**UNIT 1: SOCIAL NETWORK ANALYSIS**

Definition and Features - The Development of Social Network Analysis - Basic graph theoretical Concepts of Social Network Analysis – ties, density, path, length, distance, betweenness, centrality, clique - Electronic sources for network analysis - Electronic discussion networks, Blogsand online communities, Web-based networks.

**UNIT 2: SOCIAL NETWORK PROFILES**

Introduction – types of commercial social network profiles (CSNP) - Quantitative and QualitativeAnalysis of CSNPs – Analysis of social networks extracted from log files - Data Mining MethodsRelated to SNA and Log Mining - Clustering Techniques – Case study.

**UNIT 3: SEMANTIC TECHNOLOGY FOR SOCIAL NETWORK ANALYSIS**

Introduction to ontology-based knowledge representation - - Ontology languages for the SemanticWeb – RDF and OWL - Modeling Social network data - State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships.

**UNIT 4: SOCIAL NETWORK MINING**

Detecting and discovering Communities in Social Networks - Definition of Community - Evaluating Communities - Methods for Community Detection – divisive, spectral and modularity optimization algorithms - Applications of Community Mining Algorithms - Overview of tools for Detecting Communities - Understanding and Predicting Human Behavior for Social Communities.

**UNIT 5: VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS**

Visualization of Social Networks - Node-Edge Diagrams - Random Layout - Force-Directed Layout - Tree Layout - Matrix Representations - Hybrid Representations - Visualizing Online Social Networks - Applications - Covert Networks – Community Welfare - Collaboration Networks - Co-Citation Networks

**TEXT BOOKS**

1. Peter Mika, “Social Networks and the Semantic Web”, Springer, 1st edition 2007.
2. BorkoFurht, “Handbook of Social Network Technologies and Applications”, Springer, 1st edition, 2010.
3. GuandongXu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, Springer, 1st edition, 2011.

4. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved User Modelling”, IGI Global snippet, 2009.
5. John G. Breslin, Alexandre Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

213INT3104: INFORMATION RETRIEVAL TECHNIQUES

<table>
<tr><td rowspan="2">213INT3104</td><td rowspan="2">INFORMATION RETRIEVAL TECHNIQUES</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>0</td><td>3</td><td>4</td></tr>
<tr><td colspan="8">Prerequisite: Information Storage, Modelling and Retrieval (212INT2306)<br>Course Category: Professional Electives<br>CourseType: Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- To learn the concepts behind IR
- To understand the operation of web search
- To learn the algorithms related to text classification, indexing andsearching

**COURSE OUTCOMES:**

**CO1.** Learn use an open source search engine framework and explore its capabilities

**CO2.** Know the various modeling and evaluation techniques

**CO3.** Learn to represent documents in different ways and discuss its effect onsimilarity

**CO4.** Learn Calculations and on search

**CO5** Design and implement an innovative feature in a search engine

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| **CO\SO** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | |
| **CO2** | 2 | 3 | | | | |
| **CO3** | 3 | | | | | 2 |
| **CO4** | 2 | | | 3 | | |
| **CO5** | | 3 | | | 2 | |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

Information Retrieval – Early Developments – The IR Problem – The User‘s Task – Informationversus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

**UNIT 2: MODELING AND RETRIEVAL EVALUATION**

IR models – Classic Information Retrieval – Alternative Set Theoretic Models – Alternative Algebraic Models – Alternative Probabilistic Models – Other Models – Hypertext Models – Web based Models – Retrieval Evaluation – Cranfield Paradigm – Retrieval Metrics – ReferenceCollections – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback – Clicks – Implicit Feedback Through Local Analysis – Global Analysis – Documents: Languages & Properties – Queries: Languages & Properties.

**UNIT 3: TEXT CLASSIFICATION, INDEXING AND SEARCHING**

A Characterization of Text Classification – Unsupervised Algorithms – Supervised Algorithms-Feature Selection or Dimensionality Reduction – Evaluation metrics – Organizing the classes–Indexing and Searching – Inverted Indexes –Signature Files – Suffix Trees & Suffix Arrays – Sequential Searching – Multi-dimensional Indexing.

**UNIT 4: WEB RETRIEVAL AND WEB CRAWLING**

The Web – Search Engine Architectures – Search Engine Ranking – Managing Web Data – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation - Structured Text Retrieval.

**UNIT 5: TYPES OF IR AND APPLICATIONS**

Parallel and Distributed IR –Data Partitioning – Parallel IR – Cluster-based IR – Distributed IR- Multimedia Information Retrieval – Challenges – Content Based Image Retrieval – Audioand Music Retrieval – Retrieving and Browsing Video – Fusion Models

– Segmentation – Compression - Enterprise Search –Tasks – Architecture of Enterprise Search Systems – Enterprise Search Evaluation - Library Systems – Digital Libraries

**TEXT BOOKS**


1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", Second Edition, ACM Press Books, 2011.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", The MIT Press, 2010.


**REFERENCES**


1. C. Manning, P. Raghavan, and H. Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008.
2. Bruce Croft, Donald Metzler and Trevor Strohman, "Search Engines: Information Retrieval in Practice", First Edition, Addison Wesley, 2009.

| UNIVERSITY ELECTIVE COURSES |
|---|

214INT1301: WEB PROGRAMMING

| 214INT1301 | WEB PROGRAMMING | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn the theoretical and practical concepts of web programming.
- To introduce the programming languages for developing simple webapplications.
- To make students to understand about the architecture of web server anddeployment of web site
- To teach methodologies useful for the implementation of dynamic webapplications
- To efficiently design and implement web applications using server sideprogramming languages.

**COURSE OUTCOMES:**

**CO1.** Understand the programming concepts of HTML, DHTML, CSS, JavaScript, XML and other Web technologies

**CO2.** Understand Java programming concepts and utilize Java Graphical User Interface program writing.

**CO3.** Build Java Application for distributed environment. Design and Develop multi-tier applications.

**CO4.** Utilize professional level platforms (ASP, JSP, Servlets) to produce software systems/websites that meet specified user needs and constraints.

**C05.** Understand database basics related to develop dynamic web applications and Apply XML for designing web pages.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | | | |
| **CO2** | 2 | 3 | 2 | | | |
| **CO3** | | 3 | | 1 | | 2 |
| **CO4** | 3 | 2 | 3 | | 2 | |
| **CO5** | 1 | | | | | 3 |

**COURSE TOPIC(S):**

**UNIT 1 : INTRODUCTION**

World Wide Web – History of the World Wide Web, World Wide Web Consortium – HTML – Dynamic HTML – Object model and collections, Event model, Filters and Transitions.

**UNIT 2: JAVA SCRIPT**

Introduction – Simple program, Memory concepts, Arithmetic, Decision making - Equality and Relational operators – Control statements – Control structures, Operators – Functions – Programmer defined functions, JavaScript global functions, Recursion – Arrays – References and Reference parameters, Passing arrays to functions, Multidimensional arrays – Objects – Object types, Cookies.

**UNIT 3: XML**

Introduction, Structuring data, XML namespaces, Document Type Definitions (DTDs) and Schemas, Document type definitions, W3C XML schema documents, XML vocabularies, Document Object Model (DOM), DOM methods, Simple API for XML (SAX), Extensible Style sheet Language (XSL), Simple Object Access Protocol (SOAP).

**UNIT 4: PERL, CGI AND PHP**

Introduction, String processing and Regular expressions, Viewing Client/Server environment variables, Form processing and Business logic, Verifying a username and password, Connecting to a database, Cookies, Operator precedence chart.

**UNIT 5: JAVA PROGRAMMING**

Classes – Constructors, Garbage collection - Overloading methods – Overriding methods - Exception handling - Multithreading – Creating a thread, Synchronization, Inter thread communication - Streams – Byte streams, Character streams.

**TEXT BOOKS:**


1. Harvey Deitel, Abbey Deitel, "Internet and World Wide Web: How To Program" 5th Edition.
2. Herbert Schildt, "Java – The Complete Reference, 7th Edition". Tata McGraw- Hill.


**REFERENCES:**


1. John Pollock, "Javascript – A Beginners Guide", 3rd Edition –- Tata McGraw-Hill.
2. Keyur Shah, "Gateway to Java Programmer Sun Certification", Tata McGraw Hill, 2002.

214INT1302: INTRODUCTION TO INFORMATION SECURITY

| 214INT1302 | INTRODUCTION TO INFORMATION SECURITY | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

It covers Information Security, Vulnerabilities & threats, attacks, Risk Analysis,logical design and physical design

**COURSE OUTCOMES:**

**CO1.** Understand the importance of information security and models to develop secure information system.

**CO2.** Learn about various kinds of issues, threats, attacks involved while securing information

**CO3.** Analyze the risks involved in information security

**CO4.** Design and develop an information security system

**C05.** Learn the various technologies, tools and techniques used to ensure security.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | 2 | | |
| **CO2** | 2 | 3 | | 1 | | |
| **CO3** | | 2 | | 3 | | 1 |
| **CO4** | 1 | | | 3 | 2 | |
| **CO5** | 3 | | 2 | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION**

History, Information Security, Critical Characteristics of Information, NSTISSC Security Model,Components of an Information System, Securing the Components, Balancing Security and Access,The SDLC, The Security SDLC

**UNIT 2: SECURITY INVESTIGATION**

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

**UNIT 3: SECURITY ANALYSIS**

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

**UNIT 4: LOGICAL DESIGN**

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799,NIST Models, VISA International Security Model, Design of Security Architecture, Planning forContinuity

**UNIT 5: PHYSICAL DESIGN**

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

**TEXT BOOK**

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", 4$^{th}$Edition,Vikas Publishing House, New Delhi, 2011.

**REFERENCES**

1. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", 6$^{th}$ edition vol-5, CRC Press LLC, 2011.
2. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed 6$^{th}$ edition – Networksecurity secrets and solutions", Tata McGraw-Hill, 2009.
3. Matt Bishop, "Computer Security Art and Science", Addison-Wesley Professional, 2003.

214INT1303: ESSENTIALS OF INFORMATION TECHNOLOGY

| | | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| **214INT1303** | **ESSENTIALS OF INFORMATION TECHNOLOGY** | **2** | **0** | **2** | **0** | **3** | **4** |

Prerequisite: Nil

Course Category: Open Electives

CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

- To know the concept of Internet, Networks and its working principles and understand the various applications related to Information Technology.

**COURSE OUTCOMES:**

**CO1.** Understand the concept of website design and types of server.

**CO2.** Know about scripting languages.

**CO3.** Identify the concepts of Internet, Networks and its working principles.

**CO4.** Understand the concept of mobile communication.

**C05.** Understand various applications related to Information Technology.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | | | |
| **CO2** | 3 | 3 | | 1 | | |
| **CO3** | 3 | | | 3 | | 2 |
| **CO4** | 3 | | 2 | | 2 | 1 |
| **CO5** | 2 | | | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: WEB ESSENTIALS**

Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server

**UNIT 2: SCRIPTING ESSENTIALS**

Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP andHTML - Cookies - Simple PHP scripts

**UNIT 3: NETWORKING ESSENTIALS**

Fundamental computer network concepts - Types of computer networks - - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching -Network components.

**UNIT 4: MOBILE COMMUNICATION ESSENTIALS**

Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture -Voice calls & SMS.

**UNIT 5: APPLICATION ESSENTIALS**

Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications.

**TEXT BOOKS:**

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition,O'REILLY, 2014.
2. James F. Kurose, “Computer Networking: A Top-Down Approach”, Sixth Edition, Pearson,2012.

**REFERENCES:**

1. GottapuSasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012. 2. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, “Introduction to Information Systems”, Fifth Edition, Wiley Publication, 2014. 3. it-ebooks.org

214INT1304: R PROGRAMMING

| 214INT1304 | R PROGRAMMING | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

The student will be able to learn

- Understand what R is and what it can be used for
- Why would you choose R over another tool
- Troubleshoot software installs (keep your fingers crossed)
- Gain familiarity with using R from within the RStudio IDE
- Get to know the basic syntax of R functions
- Be able to install and load a package into your R library

**COURSE OUTCOMES:**

**CO1.** Familiarize themselves with R and the RStudio IDE

**CO2.** Understand and use the various forms of data with R

**CO3.** Access online resources for R and import new function packages into the R workspace

**CO4.** Import, review, manipulate and summarize data-sets in R

**C05.** Get insight into the capabilities of the language as a productivity tool for data manipulation and statistical analyses.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | |
| **CO2** | 2 | 3 | | | | |
| **CO3** | | 2 | | | | 3 |
| **CO4** | 3 | | 2 | | | |
| **CO5** | 3 | | | | | 1 |

**COURSE TOPIC(S) :**

**UNIT I: INTRODUCTION**

Getting R, R Version, 32-bit versus 64-bit, The R Environment, Command Line Interface, RStudio, Revolution Analytics RPE, R Packages: Installing Packages, Loading Packages, Building a Package R Basics: Basic Math, Variables, Data Types, Vectors, Calling Functions, Function Documentation, Missing Data Advanced Data Structures: data frames, Lists, Matrices, Arrays

**UNIT II: R DATA**

Reading Data into R: Reading CSVs, Excel Data, Reading from Databases, Data from Other Statistical Tools, R Binary Files, Data Included with R, Extract Data from Web Sites Statistical Graphics: Base Graphics, ggplot2

**UNIT III: R FUNCTIONS & STATEMENTS**

Writing R Functions: Hello, World!, Function Arguments, Return Values, do.call Control Statements: if and else, switch, ifelse, Compound Tests Loops: for Loops, while Loops, Controlling Loops

**UNIT IV: DATA MANIPULATION**

Group Manipulation: Apply Family, aggregate, plyr, data.table Data Reshaping: cbind and rbind, Joins, reshape2 Manipulating Strings: paste, sprint, Extracting Text, Regular

**UNIT V: R STATISTICS & LINEAR MODELING**

Probability Distributions: Normal Distribution, Binomial Distribution, Poisson Basic Statistics: Summary Statistics, Correlation and Covariance, T-Tests 200, ANOVA Linear Models: Simple Linear Regression, Multiple Regression Generalized Linear Models: Logistic Regression, Poisson Model Diagnostics: Residuals, Comparing Models, Cross-Validation, Bootstrap, Stepwise Variable Selection.

**TEXT BOOK(S):**

1. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Pearson Edu. Inc.,2nd Edition, 2017

**REFERENCES:**


1. Christian Heumann, Michael Schomaker and Shalabh, Introduction to Statistics and Data Analysis-With Exercises, Solutions and Applications in R, Springer, 2016
2. Pierre Lafaye de Micheaux, RémyDrouilhet, Benoit Liquet, The R Software-Fundamentals of Programming and Statistical Analysis, Springer 2013
3. Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, A Beginner's Guide to R (Use R) Springer 2009

214INT1305: PROGRAMMING WITH C++ AND JAVA

| 214INT1305 | PROGRAMMING WITH C++ AND JAVA | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

## COURSE OBJECTIVES:

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++.
- To demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
- To make the student to become aware of the Internet Principles, Basic WebConcepts, Mark up& Scripting Languages.
- To equip the student with the techniques of CGI, Socket and Server side programming for online communication and computing.

## COURSE OUTCOMES:

**CO1.** Understand the object-oriented concepts. To understand object oriented programming through C++.

**CO2.** Understand the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code.

**CO3.** Understand Java programming concepts and utilize Java Graphical User Interface in program writing.

**CO4.** Understand database basics related to develop dynamic web applications and Apply XML for designing web pages.

**C05.** Utilize professional level platforms (ASP, JSP, Servlets) to produce software systems/websites that meet specified user needs and constraints.Evaluate the software system/websites produced for usability, efficiency and accuracy.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | |
| **CO2** | 2 | 3 | | | | |
| **CO3** | | 2 | | 1 | | 3 |
| **CO4** | 1 | | 3 | | | |
| **CO5** | 3 | | | 2 | | 1 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION TO OOP, CLASS & OBJECTS**

Object Oriented Programming Paradigm- Basic Concepts of OOP- Benefits of OOP- Object Oriented Languages- Features of OOP- How OOP Differ from Procedure Oriented Programming- applications of OOP-a Simple C++ Program- structure of C++ Program-basic Data Types in C++- Operators in C++ - Scope Resolution Operator- Member Dereferencing Operators- memory 31 SE-Engg&Tech-SRM-2013 management operators- Introduction of Classes-Inline member functions-Objects - Arrays of Objects- Objects as Function Arguments- Static data member and static member functions – Constructors- Parameterized Constructors- Default Argument constructors - Copy Constructors- Destructors – Friend functions.

**UNIT 2: POLYMORPHISM, TEMPLATES & EXCEPTION HANDLING**

Introduction to Operator overloading- Rules for Operator overloading- overloading of binary and unary operators-Introduction to inheritance–Types of inheritance- Abstract Classes- new Operator and delete Operator- Pointers to Objects- this Pointer- Virtual Functions- Pure Virtual Functions- Introduction to Class Templates- Function Templates-Member Function Templates- Basics of Exception Handling- Types of exceptions- Exception Handling Mechanism- Throwing and Catching Mechanism- Rethrowing an Exception- Specifying Exceptions.

**UNIT 3: JAVA PROGRAMMING**

An overview of Java – Data Types – Variables and Arrays – Operators – Control Statements – Classes – Objects – Methods – Inheritance – Packages – Abstract classes – Interfaces and Inner classes – Exception handling – Introduction to Threads – Multithreading – String handling– Streams and I/O – Applets.

**UNIT 4: WEBSITES BASICS, HTML 5, CSS 3, WEB 2.0**

Web 2.0: Basics-RIA Rich Internet Applications – Collaborations tools – Understanding websites and web servers: Understanding Internet – Difference between websites and web server- Internet technologies Overview –Understanding the difference between internet and intranet; HTML and CSS: HTML 5.0 , XHTML, CSS 3.

**UNIT 5: CLIENT SIDE AND SERVER SIDE PROGRAMMING**

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,- Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript. Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server;-DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages-JSP Standard Tag Library(JSTL)-Creating HTML forms by embedding JSP code.

**TEXTBOOKS:**

1. Deitel and Deitel and Nieto, “Internet and World Wide Web – How to Program”, Prentice Hall, 5thEdition,2011.
2. Herbert Schildt, “Java-The Complete Reference”, Eighth Edition, Mc Graw Hill Professional, 2011.

**REFERENCES:**

1. 1.StephenWynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition,1999.
2. 2.Chris Bates, “Web Programming – Building Intranet Applications”, 3rd Edition, Wiley Publications, 2009.

3.Jeffrey C and Jackson, “WebTechnologies A Computer Science Perspective”, Pearson Education, 2011.

214INT1306: IT IN BUSINESS

| 214INT2306 | IT IN BUSINESS | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 4 |
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- Enable the students coming from different graduation streams to understand theworking and management of business.

**COURSE OUTCOMES:**

**CO1.** Understand relationship between environment and business; Applying the environmental analysis techniques in practice

**CO2.** Understand Economic, Socio-Cultural and Technological Environment

**CO3.** Know state policies Economic legislations and Economic reforms laid by the government

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | | |
| CO2 | 2 | 3 | | 1 | | |
| CO3 | 1 | | 2 | 3 | | |

**COURSE TOPIC(S)**

**UNIT 1:** Information systems and strategic implications Data information systems Difference between data and information Information system activities and resources System approaches Organizational sub-systems Support system Systems application in strategy building

**UNIT 2:** Functional and enterprise systems Management Information systems Types of operatingsystems - Functional and cross functional systems Organizational sub systems - Transactional processing information systems - Accounting and finance systems - Marketing andsales systems - Production and operation management systems - Human resources management systems - e-CRM- SCM - KMS - ERP – BPR.

**UNIT 3:** Introduction to E-Business Electronic Business Electronic Commerce Electronic commerce models Types of electronic commerce Value chains in Electronic commerce E-Commerce in India Internet World Wide Web Internet architectures Internet applications Web based tools for electronic commerce Intranet Composition of Intranet Business application on Intranets Extranets Electronic Data Interchange - Components of Electronic Data Interchange - Electronic Data Interchange communication process.

**UNIT 4**:Database management Systems Systems Analysis and Design DSS and ES Software for Decision Support Group Decision making Enterprise Wide computing Object oriented analysisand design

**UNIT 5:** Need for security Security techniques - Firewalls - Encrypting Cyber terrorism andother measures preventing misuse of IT

**TEXT BOOKS:**

1. Ralph StiaranGeorge Reynolds, Fundamentals of IT,Thompson
2. Introduction to IT, Pearson
3. Williams ans sawyer, IT, TMH
4. Carroll Frenzel and John Frenzel, MIS, Thompson
5. WananJawadekar,MIS, TMH
6. Ashok Arora and Akshya Bhatia, MIS,EB
7. MahadeoJaiswal and Monika Mital, MIS, Oxford

214INT2301: BIG DATA ANALYTICS

| 214INT2301 | BIG DATA ANALYTICS | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

Prepare the students to understand and practice Big Data Analytics usingHadoop Ecosystem and prepare them for a Career in Analytics as a Hadoop Developer, Hadoop Administrator, Data Scientist.

**COURSE OUTCOMES:**

**CO1.** Understand the key issues on big data, characteristics, data sources and the associated applications in intelligent business and scientific computing.

**CO2.** Acquire fundamental enabling techniques and scalable algorithms in big data analytics.

**CO3.** Interpret business models and scientific computing paradigms, and applysoftware tools for Big data analytics.

**CO4.** Achieve adequate perspectives of big data analytics in marketing, financial services, health services, social networking, astrophysics exploration, and environmental sensor applications, etc.

**C05.** Select visualization techniques and tools to analyze big data and createstatistical models and understand how to handle large amounts of data.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | | | |
| **CO2** | | 3 | | 1 | | 2 |
| **CO3** | 2 | | 3 | | | |
| **CO4** | | 2 | | 3 | | 1 |
| **CO5** | 3 | | 1 | | | 2 |

**COURSE TOPIC(S) :**

**UNIT 1: INTRODUCTION TO BIG DATA**

Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytictools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

**UNIT 2: MINING DATA STREAMS**

Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimatingmoments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions

**UNIT 3: HADOOP**

History of Hadoop- The Hadoop Distributed File System –Components of Hadoop -Analyzing The Data with Hadoop-Scaling Out-Hadoop Streaming-Design of HDFS-Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort–Task execution-Map Reduce Types and Formats

**UNIT 4: HADOOP ENVIRONMENT**

Setting up a Hadoop Cluster -Cluster specification -Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop -Administering Hadoop –HDFS -Monitoring- Maintenance-Hadoop benchmarks-Hadoop in the cloud

**UNIT 5: FRAMEWORKS**

Applications on Big Data Using Pig and Hive –Data processing operators in Pig –Hive services – HiveQL –Querying Data in Hive -fundamentals of HBase and Zoo Keeper -IBM Info Sphere-. Visualizations -Visual data analysis techniques, interaction techniques.

**TEXT BOOKS:**


1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.


**REFERENCES:**


1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics”, John Wiley & sons, 2012.
2. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O’Reilly, 2011.


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214INT2302: INFORMATION THEORY & CODING

| 214INT2302 | INFORMATION THEORY & CODING | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 4 |
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To introduce to the students the concept of information and entropy of Information.
- To know the concept of compression of information, error control of Information, and securing information through cryptography.
- Describe the mathematical foundation of compression, error control andsecurity of information.

**COURSE OUTCOMES:**

**CO1.** Understand the basic information and entropy.

**CO2.** Analyze source coding compression, decoding and error control methods asapplied in communication system.

**CO3.** Understand different types coding techniques.

**CO4.** Understand the basic number theory of coding techniques.

**C05.** Analysis the various algorithms techniques.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | |
| **CO2** | 2 | 3 | | | | 1 |
| **CO3** | 3 | | | 1 | | 2 |
| **CO4** | | 2 | | 3 | | |
| **CO5** | 1 | | 2 | | | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: INFORMATION THEORY & SOURCE CODING**

Introduction to Information Theory- Entropy & Types of Entropy Source Coding, Prefix Coding,Channel Capacity

**UNIT 2: COMPRESSION ALGORITHMS**

Optimal Compression- Compression Algorithms, Huffman Coding, Adaptive Huffman Compression, Dictionary Based Compression, Speech Compression, Sliding Window Compression, LZW,RLE, Lossy& Lossless Compression Schemes, Image Compression – GIF,JPEG

**UNIT 3: ERROR CONTROL CODING TECHNIQUES**

Types of Codes - Error Checking & Correcting Codes, Linear Block Codes, Cyclic Codes, BCH

Codes, Convolution Codes

**UNIT 4: BASIC NUMBER THEORY**

Modular Arithmetic, Solving ax+by=d, Congruence's, Chinese Remainder Theorem Modular Exponentiation, Fermat's Little and Euler Theorem, Prime Number Generation, Random Number Generation, Primitive Roots, Legendre and Jacobi Symbols, Discrete Probability, Discrete Logarithms

**UNIT 5: CRYPTOGRAPHIC TECHNIQUES**

Security Goals, Threats and Attack on Information-Classic Cryptography-Symmetric Key Cryptography – Stream Ciphers, Block Cipher, Stream Cipher, DES, Triple DES,AES-Publicand Private Key Cryptography – RSA, Diffie-Hellman-Hash Function – MD5,SHA-1,DigitalSignature

**TEXTBOOKS**

1. Ranjan Bose, "Information Theory, Coding and Cryptography", Tata McGrawHill , SecondEdition.2012
2. R Avudaiammal, "Information Coding Techniques", Tata McGrawHill , Second Edition.2009

## REFERENCES

1. Mark Nelson, “Data Compression Book”, BPB Publication $2^{nd}$ edition 2002.
2. Watkinson J, “Compression in Video and Audio”, Focal Press, London, 2005.

214INT2303: CYBER FORENSICS

| 214INT2303 | CYBER FORENSICS | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 4 |
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To understand the fundamentals of Computer Forensics and computing Investigations.
- To recognize the legal underpinnings and critical laws affecting forensics.
- To apply the tools and methods to uncover hidden information in digitalsystems.
- To learn about current licensing and certification requirements to buildthe career in digital forensic.

**COURSE OUTCOMES:**

**CO1.** Understand of the role of computer forensics

**CO2.** Identify some of the current techniques and tools

**CO3.** Describe and identify basic principles of good professional practice for a forensic computing practitioner

**CO4.** Demonstrate an understanding of issues related to privacy and determine how to address them technically and ethically.

**C05.** Apply some forensic tools in different situations.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | |
| **CO2** | 2 | 3 | | | | 1 |
| **CO3** | | | 3 | 2 | | |
| **CO4** | 1 | | | 3 | | 2 |
| **CO5** | 2 | | | | 1 | 3 |

**COURSE TOPIC(S) :**

**UNIT 1: NTRODUCTION**

The Scope of Computer Forensics - Windows Operating and File Systems –Handling ComputerHardware – Anatomy of Digital Investigation.

**UNIT 2: INVESTIGATIVE SMART PRACTICES**

Forensics Investigative Smart Practices – Time and Forensics – Incident closure

**UNIT 3: LAWS AND PRIVACY CONCERNS**

Laws Affecting Forensic Investigations – Search Warrants and Subpoenas – Legislated PrivacyConcerns – The admissibility of Evidence – First Response and Digital Investigator

**UNIT 4: DATA ACQUISITION AND REPORT WRITING**

Data Acquisition – Finding Lost Files – Document Analysis – Case Management and ReportWriting – Building a Forensics Workstation

**UNIT 5: TOOLS AND CASE STUDIES**

Tools of the Digital Investigator - Licensing and Certification – Case Studies: E-mail Forensics –Web Forensics – Searching the Network – Excavating a Cloud – Mobile device Forensics.

**TEXTBOOKS:**


1. Michael Graves, "Digital Archaeology: The Art and Science of Digital Forensics", Addison-Wesley Professional, 2014.
2. Darren R. Hayes, "Practical Guide to Computer Forensics Investigation", Pearson, 2015.
3. Albert J. Marcella and Frederic Guillossou, "Cyber Forensics: From Data to DigitalEvidence " Wiley, 2015.


**REFERENCE:**


1. Bill Nelson, Amelia Phillips and Christopher Steuart, "Guide to Computer Forensics andInvestigations", Fourth Edition, Cengage Learning, 2013.

214INT2304: INTERNET AND JAVA

| 214INT2304 | INTERNET AND JAVA | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 4 |
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn the basics of Internetworking, Routing, World Wide Web, Java Programming with simple case studies.

**COURSE OUTCOMES:**

**CO1.** Understand the concept of Internetworking with TCP/IP

**CO2.** Learn routing for high speed multimedia traffic

**CO3.** Learn the fundamentals in WWW, HTML and XML.

**CO4.** Understand Java for Networking application

**C05.** Understand the basic concepts in E-com, Network operating system and Web design.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | |
| **CO2** | 2 | 3 | | | | |
| **CO3** | | 2 | | | | 1 |
| **CO4** | 1 | | 3 | 3 | | 2 |
| **CO5** | 2 | | | 1 | | |

**COURSE TOPIC(S) :**

**UNIT 1: INTERNETWORKING WITH TCP / IP**

Review of network technologies, Internet addressing, Address resolution protocols (ARP / RARP), Routing IP datagrams, Reliable stream transport service (TCP) TCP / IP over ATM networks, Internet applications - E-mail, Telnet, FTP, NFS, Internet traffic management.

**UNIT 2: INTERNET ROUTING**

Concepts of graph theory, Routing protocols, Distance vector protocols (RIP), Link state protocol (OSPP), Path vector protocols (BGP and IDRP), Routing for high speed multimediatraffic, Multicasting, Resource reservation (RSVP), IP switching.

**UNIT 3: WORLD WIDE WEB**

HTTP protocol, Web browsers netscape, Internet explorer, Web site and Web page design,HTML, Dynamic HTML, CGI, Java script.

**UNIT 4: INTRODUCTION TO JAVA**

The java programming environment, Fundamental Programming structures, Objects and Classes, Inheritance, Event handling, Exceptions and Debugging, Multithreading , RMI.

**UNIT 5: JAVA PROGRAMMING**

Networking with Java, Swing: Applets and Applications, Menu's & Tool Bars, Java andXML – Creating packages, Interfaces, JAR files & Annotations, Javabeans, JDBC.

**TEXTBOOKS**

1. Douglas E.Comer, "Internetworking with TCP/IP", Vol. I: 5th edition, PearsonEducation, 2007 (Unit – I &II)
2. Robert W.Sebesta, "Programming the worldwide web", 3/e, Pearson Education, 2007.
3. Steven Holzner et. al, "Java 2 Programming" , Black Book, Dreamtech Press, 2006.

## REFERENCES


1. Cay S.Hortsmann, Gary Cornwell, “Core Java 2”, Vol I, Pearson Education, 7/e, 2005.
2. W. Richard Stevens, “ TCP/IP Illustrated, The Protocol” , Vol I , Pearson Education,1st Edition, 2006.
3. Behrouz A. Farouzon , “TCP/IP Protocol Suite, 3rd edition , Tata McGraw Hill, 2007

214INT2305: NETWORK PROTOCOLS

| 214INT2305 | NETWORK PROROCOLS | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 4 |

Prerequisite: Nil

Course Category: Open Electives

CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

It understands the networking concepts and Multiple protocols types.

**COURSE OUTCOMES:**

**CO1.** Understand the existing network architecture models and analyzes their performance.

**CO2.** Understand the multiple layers of the protocol.

**CO3.** Understand the high speed network protocols and design issues.

**CO4.** Learn Network Security Technologies and Protocols.

**C05.** To study various protocols in wireless LAN, MAN.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 2 | 3 | | | | 1 |
| **CO3** | 3 | | 1 | | | 2 |
| **CO4** | | | 2 | 3 | | |
| **CO5** | 1 | | | 2 | 3 | |

**COURSE TOPIC(S) :**

**UNIT 1: FUNDAMENTALS OF NETWORKING STANDARDS AND PROTOCOLS**

Network Communication Architecture and Protocols - OSI Network Architecture seven Layers Model - Definition and Overview of TCP/IP Protocols -TCP/IP Four Layers Architecture Model

- Other Network Architecture Models: IBM SNA.

**UNIT 2: ROUTED AND ROUTING PROTOCOLS**

Application Layer Protocols-Presentation Layer Protocols- Session Layer Protocols - Transport Layer Protocols - Network Layer Protocols - Data Link Layer Protocols - Routing Protocols - Multicasting Protocols - MPLS.

**UNIT 3: SDN AND NETWORK MANAGEMENT PROTOCOLS**

Overview of ISDN − Channels − User access – Protocols Network management requirements − Network monitoring − Network control − SNMP V1, V2 and V3 − Concepts, MIBs − Implementation issues-RMON.

**UNIT 4: SECURITY AND TELEPHONY PROTOCOLS**

Network Security Technologies and Protocols - AAA Protocols - Tunneling Protocols - Security Protocols- Private key encryption − Data encryption system, public key encryption − RSA − Elliptic curve cryptography − Authentication mechanisms− Web security -Secured Routing Protocols - IP telephony -Voice over IP and VOIP Protocols – Signaling Protocols- Media/CODEC.

**UNIT 5: NETWORK ENVIRONMENTS AND PROTOCOLS**

Wide Area Network and WAN Protocols - Frame relay - ATM - Broadband Access Protocols - PPP Protocols - Local Area Network and LAN Protocols - Ethernet Protocols - Virtual LAN Protocols - Wireless LAN Protocols - Metropolitan Area Network and MAN Protocol - Storage Area Network and SAN Protocols.

**TEXT BOOK**

1. Javvin, “Network Protocols” ,Javvin Technologies Inc , second edition, 2005
2. William Stallings, “Cryptography and Network Security”, PHI, 2000.
3. Mani Subramanian, “Network Management−Principles and Practices”, Addison Wesley, 2000.

**REFERENCES**

1. William Stallings, “SNMP, SNMPV2, SNMPV3 and RMON1 and 2”, 3rd Edition, AddisonWesley, 1999.
2. William Stallings, “Data and Computer Communications” 5th Edition, PHI, 1997.

214INT2306: INTRODUCTION TO STORAGE MANAGEMENT

<table>
<tr><td rowspan="2">214INT2306</td><td rowspan="2">INTRODUCTION TO STORAGE MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>0</td><td>3</td><td>4</td></tr>
<tr><td colspan="8">Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory</td></tr>
</table>

## COURSE OBJECTIVES:

- Understand Storage Area Networks characteristics and components.
- Describe the challenges associated with data center networking and the need for switch network convergence.
- Storage Area Networks including storage architectures, logical and physicalcomponents of a storage infrastructure, managing and monitoring the data center.

## COURSE OUTCOMES:

**CO1.** Identify and describe challenges in data storage and data management.

**CO2.** Discuss different types of logical and physical components of a storage infrastructure.

**CO3.** Understand benefits of the different network storage options for different application environments.

**CO4.** Identify and analyzes the common threats in each domain.

**C05.** Know about the virtualization Techniques.

## MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | | | |
| **CO2** | | 3 | | | | 3 |
| **CO3** | 2 | | | | | 3 |
| **CO4** | 3 | | 1 | | 3 | 3 |
| **CO5** | 2 | | | | | |

## COURSE TOPIC(S)

### UNIT 1: INTRODUCTION TO STORAGE TECHNOLOGY

Review data creation and the amount of data being created and understand the value of data to business - challenges in data storage and data management - Solutions available or data storage - Core elements of a data center infrastructure - role of each element in supporting business activities.

### UNIT 2: STORAGE SYSTEMS

Hardware and software components of the host environment - Key protocols and concepts used by each component - Physical and logical components of a connectivity environment Major physical disk - access characteristics - and performance implications

### UNIT 3: NETWORKED STORAGE

Evolution of networked storage – Architecture – Components - and topologies of FC-SAN, NAS, and IP-SA Benefits of the different networked storage options -Understand the need for long-term archiving solutions

### UNIT 4: DATA CENTER

List reasons for planned/unplanned outages and the impact of downtime - impact of downtime - Differentiate between business continuity (BC) and disaster recovery (DR) - RTO and RPO - Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures - Architecture of backup/recovery and the different backup/recovery topologies- key management tasks in a data center.

### UNIT 5: VIRTUALIZATION

Virtualization technologies – block-level and file-level virtualization technologies and Processes

**TEXT BOOK**

1. EMC, EMC Education Services, Lastemc, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", John Wiley and Sons, 2010.

**REFERENCES**

1. Robert Spalding, "Storage Networks: The Complete Reference". Tata McGraw Hill,Osborne, 2003
2. Marc Farley, "Building Storage Networks", 2nd Edition, Tata McGraw Hill, Osborne,2001.
3. Meeta Gupta, "Storage Area Network Fundamentals", Pearson Education Limited, 2002.

214INT2307: PRINCIPLES AND PRACTICES OF COMMUNICATION SYSTEM

| 214INT2307 | PRINCIPLES AND PRACTICES OF COMMUNICATION SYSTEM | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 4 |

Prerequisite: Nil

Course Category: Open Electives

CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

- To explain QoS requirements and compare different approaches to QoS.
- To appreciate need for high-speed networks
- To identify reliability issues and provide solutions

**COURSE OUTCOMES:**

**CO1.** Demonstrate the knowledge of fundamental elements and concepts related to Communication System.

**CO2.** Address the challenges imposed on different types of Communication Systems.

**CO3.** Use and apply important methods in communication systems to support bothanalog and digital communication.

**CO4.** Provide solutions to digital communication by using different modulation techniques.

**C05.** Understand the concepts of digital transmission techniques

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 2 | 3 | | 1 | | |
| **CO3** | 3 | | 2 | | | 1 |
| **CO4** | | | 1 | 3 | | 2 |
| **CO5** | 1 | | | 2 | 3 | |

**COURSE TOPIC(S)**

**UNIT 1: INTERNETWORKING**

IPv6 - Design issues - Scalability - Addressing - Headers - Routing - Auto configuration - Transition from IPv4 to IPv6 - Interoperability - QoS in IPv6 - Multicast support - ICMPv6 - Security in IPv6

**UNIT 2: QUALITY OF SERVICE**

QoS taxonomy - Resource allocation - Scheduling - Queuing disciplines - Delay Analysis Integrated services - Differentiated services - RSVP.

**UNIT 3: MPLS AND VPN**

MPLS Architecture - MPLS to GMPLS - Traffic engineering with MPLS - QoS -Network recovery and restoration with MPLS – VPN L2 – VPN L3 .

**UNIT 4**: **OPTICAL NETWORKS**

Photonic Packet switching - WDM network design - Introduction to optical networks - optical layer - SONET/SDH - Optical packet switching - Client layers - Signaling protocols and networkoperation

**UNIT 5: SOFTWARE DEFINED NETWORKING**

Introduction to SDN - Network Function Virtualization - Data Plane- Control Plane - SDN software stack - Data center Traffic Management

**TEXT BOOKS:**


1. Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, FifthEdition, Elsevier/Morgan Kaufmann Publishers, 2011.
2. Bruce S. Davie, Adrian Farrel, ―MPLS: Next Steps‖, Morgan Kaufmann Publishers, 2011.
3. Rajiv Ramaswami, Kumar N. Sivarajan and Galen H. Sasaki, "Optical Networks A PracticalPerspective " ,Third Edition, Morgan Kaufmann,2010.


**REFERENCES**


1. William Stallings, "High-speed networks and internets ", Second Edition Pearson EducationIndia, 2002.
2. Ying-Dar Lin , Ren-Hung Hwang , Fred Baker , "Computer Networks: An Open SourceApproach", McGraw-Hill Higher Education, 2011.

214INT2308: SOFTWARE TESTING

<table>
<tr><td rowspan="2">214INT2308</td><td rowspan="2">SOFTWARE TESTING</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>0</td><td>3</td><td>4</td></tr>
<tr><td colspan="8">Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- This course helps to understand theories, methods, and technologies applied for professional software development.
- To define software engineering and explain its importance
- To discuss the concepts of software products and software processes

**COURSE OUTCOMES:**

**CO1.** Analyze and identify an appropriate process model for a given project

**CO2.** Understand the principles at various phases of software development

**CO3.** Understand the software project estimation models and estimate the work to be done, resources required and the schedule for a software project

**CO4.** Translate specifications into design, and identify the components to build the architecture for a given problem, all using an appropriate software engineering methodology

**C05.** Define a Project Management Plan and tabulate appropriate Testing Plans at different levels during the development of the software

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | | 3 | | | | |
| **CO3** | 2 | | 2 | | | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO4** | 1 | | 3 | | 2 | |
| **CO5** | 2 | | | | 3 | |

**COURSE TOPIC(S)**

**UNIT 1 : SOFTWARE ENGINEERING CONCEPTS**

Software and Software Engineering - Project Management Concepts - Software Engineering Paradigms – Generic Process Models, Assessment and Improvement - Water Fall Life Cycle Model - Prototype Model - RAD Model - Spiral Model - Incremental Model –Requirements Engineering

**UNIT 2: MANAGING SOFTWARE PROJECTS**

Metrics : Metrics in Process and Project Domains - Software Measurement - Metrics for Software Quality - Integrating Metrics in a Software Engineering Process - Estimation , Scheduling – Risk Management – Review Techniques - Software Quality Assurance

**UNIT 3 : DESIGN CONCEPTS**

Design Process - Design Principles - Design Concepts - Software Architecture – Architectural Style, Design and Mapping - User Interface Design

**UNIT 4: SOFTWARE TESTING AND DEBUGGING**

Testing Fundamentals and Strategies - White-box and Black-box testing - Basis Path Testing - Data Flow Testing - Testing for Special Environments - Unit Testing, - Integration Testing - Validation Testing - System Testing – Debugging - Software Maintenance – Software Configuration Management

**UNIT 5 : ADVANCED TOPICS**

Computer Aided Software Engineering - Clean room software engineering – Reengineering - Reverse Engineering

**PRACTICAL COMPONENTS**

1. Introduction to UML (Unified Modeling Language)
   a) Visualizing
   b) Specifying

c) Constructing

d) Documenting

2. Program Analysis and Project Planning : Study of Problem definition – Identification of project Scope, Objectives, Infrastructure
3. Preparation of System Requirement Specification (SRS) and related analysis documents as Per the guidelines in ANSI/IEEE Std 830-1984.
4. Create UML Diagrams (Use diagrams, Activity diagrams, Class diagrams, Sequence diagrams)
5. Software Development (Implementation)
6. Software Testing and Prepare test plan,
7. Execution of Test cases.
8. Debugging and demonstration.

**TEXTBOOK**


1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", seventh Edition, Mc- Graw Hill, 2014.


**REFERENCE BOOKS**


1. 1.Steve McConnell, "Code Complete", Second Edition, Microsoft Press.2004
2. 2.Ian Somerville, "Software Engineering", Addison-Wesley, Ninth edition, 2011.
3. 3.Richard E. Fairley, "Software Engineering Concepts", Second Edition McGraw- Hill, 1985.

214INT2309: EMBEDDED C PROGRAMMING

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **214INT2309** | **EMBEDDED C PROGRAMMING** | **L**<br>**2** | **T**<br>**0** | **P**<br>**2** | **X**<br>**0** | **C**<br>**3** | **H**<br>**4** |
| Prerequisite: Nil<br>Course Category: Professional Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To introduce the Significance and the role of embedded system forautomation.
- To understand the embedded system role in IOT and use it for application development.
- To observe the need for smart cities and systems
- To introduce the automotive embedded systems
- To observe the evolving trend in communication based automotivesystems.

**COURSE OUTCOMES:**

**CO1.** Identify Embedded C software components and know how they are differentfrom standard C software components

**CO2.** Execute how to break big problems into small problems using functions and recursive functions

**CO3.** Utilize hardware/software signaling mechanism to implement effective communication between embedded software stack and hardware using theconcept of array.

**CO4.** Understand embedded controller hardware and software stack and their respective differences from traditional software development using the conceptof pointer

**CO5.** Comprehend hardware communication protocols for implementation with other peripheral hardware devices such as GPIO, ADC, and Serial I/O

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | 1 | | | 2 |
| **CO2** | 2 | 3 | | | | |
| **CO3** | 2 | | | 3 | | |
| **CO4** | | | 2 | 1 | | 1 |
| **CO5** | 3 | 2 | | 3 | 1 | |

**COURSE TOPIC(S)**

**UNIT I OVERVIEW**

C Overview and Program Structure; Constants-Bits & Bytes, Syntax of C Constants; PreprocessorDirectives- Standard Preprocessor Directives; Data Variables and Types- Data Types; Expressions and Operators; Statements-Definitions, Side Effects, Nesting, Indentation and use of braces, Design documentation , Program complexity.

**UNIT II FUNCTIONS**

Main() function, Function definition, parameters, Advanced features, Return values, Inline functions, Nested functions, Recursive functions, sequence points, well-structured programs, design documentation, Implementations

**UNIT III ARRAYS AND STRUCTURES**

Arrays- Array Initializers, Constant Arrays, String variables, Dimensionless arrays, Multidimensional arrays, Index Range, Example Array usage, Lookup table, Searching and Sorting Arrays; Structures- Structure Nesting and Arrays, Structure Layout in memory, Bit Field, Unions, Example of Structure in a program.

**UNIT IV STRINGS, MEMORY AND POINTERS**

String- String copy and length, String Search, String compare, String Manipulation, String Input and Output, String conversion to/from Numbers, Character Manipulation, and Constant String Manipulation; Memory and Pointers- Memory, Address of operator, Indirection operator, Forcing a variable address, Pointer types, Pointer math, Back to subscripts, Back to function parameters, Back to structures, Function pointers, Other uses of pointers, ROM pointers, User- defined memory, Compatible note, over the Hill.

**UNIT V PIC MICROCONTROLLER AND INTERFACING**

PIC Microcontroller, Assembly Language Instructions, Pin Configuration, GPIO Programming- Registers, Interfacing of Relays, Buzzer, switch, LEDs, Basics of LCD Interfacing, 16x2 LCD Features and Pin Diagram, LCD Interfacing Embedded C Program, 4x4 Matrix Keyboard Interfacing, Stepper Motor Interfacing.

**TEXT BOOK**


1. Mark Siegesmund, “Embedded C Programming Techniques and Applications of C andPIC MCUS”, ScienceDirect, Elsevier, 2015.
2. Matrin P. Bates, “Programming 8-bit PIC Microcontrollers in C with interactiveHardware simulation”, Newnespress, Second Edition, 2018

214INT2310: EMBEDDED SYSTEM AUTOMATION

| 214INT2310 | EMBEDDED SYSTEM AUTOMATION | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 4 |

Prerequisite: Nil

Course Category: Open Electives

CourseType: Integrated Course with Theory

**COURSE OBJECTIVES:**

- To introduce the Significance and the role of embedded system forautomation.
- To understand the embedded system role in IOT and use it for application development.
- To observe the need for smart cities and systems
- To introduce the automotive embedded systems
- To observe the evolving trend in communication based automotivesystems

**COURSE OUTCOMES:**

**CO1.** Ability to understand hardware and software requirements in embedded systems.

**CO2.** Ability to do develop data management through cloud interface with processor technology

**CO3.** Learn the development smart system solutions and analyse issues.

**CO4.** Ability to understand the types of sensors and Bus for control implementation.

**CO5.** Capacity to involve communication concepts for vehicle application developement development.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | | 1 | | | 2 |
| CO2 | 2 | 3 | | | | 1 |
| CO3 | | | 2 | 1 | | |
| CO4 | 2 | 2 | | 3 | | 1 |
| CO5 | 3 | | 1 | 2 | 2 | |

**COURSE TOPIC(S)**

**UNIT I EMBEDDED SYSTEMS DESIGN**

Overview of Embedded system - Design process in embedded system- Communication ProtocolsEmbedded SOC- RTOS- Embedded product Development Life Cycle.

**UNIT II EMBEDDED SYSTEM FOR IOT**

Overview of IOT- Sensing- Actuation- IOT Networking- Communication protocols-data handling and analytics- cloud computing- Implementation of IOT with Raspberry pi- Industrial IOT.

**UNIT III EMBEDDED SYSTEMS AND IOT APPLICATIONS**

Embedded system for Smart Meter- smart Grid -Smart cities and smart homes, Agriculture and Healthcare, Energy auditing.

**UNIT IV EMBEDDED SYSTEM FOR AUTOMOTIVE SYSTEM**

Electronic control Unit – VehicleManagement Systems- Sensors- Actuators-Vehicle Communication protocols –Infotronics- Introduction to AUTO SAR.

**UNIT V ADVANCES IN AUTOMOTIVE ELECTRONIC SYSTEMS**

Introduction to electric and hybrid vehicles – onboard diagnostics- Connected Cars technology - Autonomous vehicles - Safety and Collision Avoidance – Navigation support for vehicles- Battery Management- Plug in Electrical vehicle- Charging station- Solar powered vehicles.

**TEXT BOOKS:**


1. Peckol, “Embedded system Design”,JohnWiley&Sons,2010
2. William B. Ribbens, Understanding Automotive Electronics, 6th edition, YES DEE Publishing Private Limited, 2011.
3. The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press), 1st Edition , 2017

**REFERENCES:**


1. Rajkamal, ‘Embedded system-Architecture, Programming, Design’, TMH,2011
2. Ronald k. Jurgen, Automotive Electronics Handbook, 2nd edition, McGraw-Hill, 2007.
3. MehrdadEhsani, ‘Modern Electric, Hybrid Electric and Fuel cell vehicles’, CRC Press Second edition 2011
4. Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press) Research papers, 2014.

214INT2311: SYSTEM ON CHIP DESIGN

| 214INT2311 | SYSTEM ON CHIP DESIGN | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 0 | 3 | 4 |
| Prerequisite: Nil<br>Course Category: Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- With technological advances that allow us to integrate complete multi-processor systems on a single die, Systems-on-Chip (SoCs) are at the core of most embedded computing and consumer devices, such as cell phones, media players and automotive, aerospace or medical electronics. This course will provide an understanding of the concepts, issues, and process of designing highly integrated SoCs following systematic hardware/software co-design & co-verification principles.

**COURSE OUTCOMES:**

**CO1.** Memorize the system architecture, components of system hardware andsoftware.

**CO2.** Know the basic concepts of processor architecture and instructions and delays.

**CO3.** Describe external and internal memory of SOC and organization.

**CO4.** Explain bus architectures, models of SOC and Know SOC customization and reconfiguration technologies.

**CO5.** Apply the knowledge of SOC design in real time applications.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | | | 1 |
| **CO2** | | 3 | | | | |
| **CO3** | | | 2 | 1 | | |
| **CO4** | 1 | 2 | | 3 | | 2 |
| **CO5** | 3 | | | 3 | 1 | 3 |

**COURSE TOPIC(S)**

**UNIT-I: SOC FUNDAMENTALS**

Essential issues of SoC design – A SoC for Digital still camera – multimedia IP development :Image and video codecs.

**UNIT-II: SOC SOFTWARE AND ENERGY MANAGEMENT**

SoC embedded software – energy management techniques for SoC design

**UNIT-III: SYSTEM DESIGN AND METHODOLOGY**

Design methodology for NOC based systems – Mapping concurrent application onto architectural platforms.

**UNIT-IV: HARDWARE AND BASIC INFRASTRUCTURE**

Packet switched network for on-chip communication – energy reliability tradeoff for NoC's –clocking strategies – parallel computer as a NoC's region.

**UNIT-V: SOFTWARE AND APPLICATION INTERFACES**

MP-SoC from software to hardware – NoC APIs – multilevel software validation for NoC –Software for network on chip

**REFERENCE BOOKS**

1. Axel Jantsch, HannuTenhunen, "Network on chips", Kluwer Academic Publishers, 2003.
2. Youn-Long, Steve Lin, "Essential Issues of SoC Design: Designing Complex Systems-On-Chip", Springer, 2006

214INT3301: HIGH SPEED NETWORKS

<table>
<tr><td rowspan="2">214INT3301</td><td rowspan="2">HIGH SPEED NETWORKS</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>0</td><td>3</td><td>4</td></tr>
<tr><td colspan="8">Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- To highlight the features of different technologies involved in High SpeedNetworking and their performance

**COURSE OUTCOMES:**

**CO1.** Students will get an introduction about ATM and Frame relay.

**CO2.** Enable to know techniques involved to support real-time traffic and congestion control.

**CO3.** Understand the concept of traffic management.

**CO4.** Understand different services in network.

**C05.** Students will be provided with different levels of quality of service (Q.S) to different applications.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | | 3 | | | | 1 |
| **CO3** | 3 | | 1 | | | 2 |
| **CO4** | | | 2 | 3 | | |
| **CO5** | 3 | | | 2 | 3 | |

**COURSE TOPIC(S)**

**UNIT 1: HIGH SPEED NETWORKS**

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet – Gigabit Ethernet – Fiber Channel – Wireless LAN's, WiFi and WiMax Networks applications, requirements – Architecture of 802.11.

**UNIT 2: CONGESTION AND TRAFFIC MANAGEMENT**

Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

**UNIT 3: TCP AND ATM CONGESTION CONTROL**

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Framework, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats – ABR Capacity allocations – GFR traffic management.

**UNIT 4: INTEGRATED AND DIFFERENTIATED SERVICES**

Integrated Services Architecture – Approach, Components, Services – Queuing Discipline – FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

**UNIT 5: PROTOCOLS FOR QOS SUPPORT (9 Hours)**

RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP – Protocol Architecture – Data Transfer Protocol – RTCP.

**TEXTBOOKS:**

1. William Stallings, “High speed networks and internet”, Second Edition, Pearson Education, 2002.

**REFERENCES:**

1. Warland, Pravin Varaiya, “High performance communication networks”, Second Edition, Jean Harcourt Asia Pvt. Ltd., 2001.
2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, “MPLS and VPN architecture”, Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, “ATM Technology for Broad Band Telecommunication Networks”, CRC Press, New York., 2010.

214INT3302: MULTIMEDIA CODING AND COMMUNICATION

| 214INT3302 | MULTIMEDIA CODING AND COMMUNICATION | L<br>2 | T<br>0 | P<br>2 | X<br>0 | C<br>3 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Nil<br>Course Category: Open Electives<br>CourseType: Integrated Course with Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To introduce the Significance and the role of embedded system forautomation.
- To understand the embedded system role in IOT and use it for application development.
- To observe the need for smart cities and systems
- To introduce the automotive embedded systems
- To observe the evolving trend in communication based automotivesystems.

**COURSE OUTCOMES:**

**CO1.** Describe technical characteristics and performance of multimedia system and terminals

**CO2.** Design creative approach in application of multimedia devices, equipment and systems

**CO3.** Interpret and analyse measurement results obtained on the multimedia system and components

**CO4.** Describe the development process and applications of the multimedia systems.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| CO1 | 3 | | 1 | | | 2 |
| CO2 | | 3 | | | | |
| CO3 | 3 | 2 | 3 | 1 | | |
| CO4 | 3 | | | 2 | | 1 |

**COURSE TOPIC(S)**

**UNIT I- MULTIMEDIA OVERVIEW**:

Introduction, Multimedia presentation and production, Multimedia and hypermedia, Hardware and software requirements, uses of multimedia, Multimedia Authoring, Editing and authoring tools. Components of Multimedia: Text – types, Unicode standard on file format; Image and graphics, data types, file formats, color science and color model;Audio- digitization, midi, quantization and transformation of audio; Video- types ofvideo signals,analog and digital video, television broadcast standards, pc video; animation-, principals and techniques, 3D animation, camera, special effects, rendering.

**UNIT II-LOSSLESS COMPRESSION TECHNIQUES:**

Introduction, Run-length coding, Variable length coding (Shannon-Fano, Huffman, adaptive Huffman), Dictionary based coding, Arithmetic coding, Lossless image compression.

**UNIT III-LOSSY COMPRESSION TECHNIQUES:**

Introduction, Distortion measure, Quantization, transform coding, Wave-let based coding, Wavelet packets. Elements of Image Compression System and Standards: JPEG standard, JPEG-2000 standard, JPEG-LS standard, Bi-level Image Compression standard.

**UNIT -IV:**

Video Coding and Compressing Standards: Introduction, Motion estimation, MPEG-1, MPEG-2, MPEG-4, MPEG-7 etc. Audio compression Standards: ADPCM, psychoacoustics, MP3, MPEG.

**UNIT V-MULTIMEDIA COMMUNICATION AND RETRIEVAL:**

Basics of networks, multiplexing technologies, LAN, WAN, ATM, quality of multimedia data transmission, multimedia over IP (RTP, RTCP, RSVP, RTSP), multimedia over ATM networks. Multimedia architecture: User interface, distributed multimedia application, Play back architecture, temporal relationship, synchronization, multimedia database system, feature extract of image, audio, video.

**TEXT BOOKS:**

i) Fundamentals of Multimedia By Ze-Nian Li & Mark S. Drew

ii) Multimedia Computing communications & Applications By Ralf Stiemetz

iii) Multimedia Communications: Applications, Networks, Protocols and Standards By Fred Halsall

**REFERENCES:**


1. Rajkamal, ‘Embedded system-Architecture, Programming, Design’, TMH,2011
2. Ronald k. Jurgen, Automotive Electronics Handbook, 2nd edition, McGraw-Hill, 2007.
3. MehrdadEhsani, ‘Modern Electric, Hybrid Electric and Fuel cell vehicles’, CRC Press Second edition 2011
4. Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press) Research papers, 2014

**Honors Elective Course**

213INT4101: ADVANCED NETWORKS

| 213INT4101 | ADVANCED NETWORKS | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 4 | 0 | 0 | 0 | 4 | 4 |
| Prerequisite: Data Communications and Computer Networks (212INT3301)<br>Course Category: Honours Elective<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To explain QoS requirements and compare different approaches to QoS.
- To appreciate need for high speed networks
- To identify reliability issues and provide solutions

**COURSE OUTCOMES:**

**CO1.** Gain an understanding of advanced networks concept.

**CO2.** Describe the principles behind the enhancement in networking

**CO3.** Know the recent development in networks

**CO4.** Know the optical network design

**CO5.** Know the virtualization.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 2 | 3 | | 1 | | |
| **CO3** | 3 | | 1 | | | 2 |
| **CO4** | | | 2 | 3 | | 1 |
| **CO5** | 1 | | | 2 | 3 | |

**COURSE TOPIC(S)**

**UNIT 1: INTERNETWORKING**

IPv6 - Design issues - Scalability - Addressing - Headers - Routing - Auto configuration - Transition from IPv4 to IPv6 - Interoperability - QoS in IPv6 - Multicast support - ICMPv6 - Security in IPv6

**UNIT 2: QUALITY OF SERVICE**

QoS taxonomy - Resource allocation - Scheduling - Queuing disciplines - Delay Analysis Integrated services - Differentiated services - RSVP.

**UNIT 3: MPLS AND VPN**

MPLS Architecture - MPLS to GMPLS - Traffic engineering with MPLS - QoS -Network recoveryand restoration with MPLS – VPN L2 – VPN L3 .

**UNIT 4: OPTICAL NETWORKS**

Photonic Packet switching - WDM network design - Introduction to optical networks -optical layer - SONET/SDH - Optical packet switching - Client layers - Signaling protocols and networkoperation

**UNIT 5: SOFTWARE DEFINED NETWORKING**

Introduction to SDN - Network Function Virtualization - Data Plane- Control Plane – SDN software stack - Data center Traffic Management

**TEXT BOOKS:**


1. Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, FifthEdition, Elsevier/Morgan Kaufmann Publishers, 2011.
2. Bruce S. Davie, Adrian Farrel, ―MPLS: Next Steps‖, Morgan Kaufmann Publishers, 2011.
3. Rajiv Ramaswami, Kumar N. Sivarajan and Galen H. Sasaki, "Optical Networks A PracticalPerspective " ,Third Edition, Morgan Kaufmann,2010.

**REFERENCES:**


1. William Stallings, “High-speed networks and internets ", Second Edition Pearson EducationIndia, 2002.
2. Ying-Dar Lin , Ren-Hung Hwang , Fred Baker , "Computer Networks: An Open SourceApproach", McGraw-Hill Higher Education, 2011.

213INT4102: AGENT BASED INTELLIGENT SYSTEMS

| **213INT4102** | **AGENT BASED INTELLIGENT SYSTEMS** | **L** | **T** | **P** | **X** | **C** | **H** |
|---|---|---|---|---|---|---|---|
| | | **4** | **0** | **0** | **0** | **4** | **4** |

Prerequisite: Artificial Intelligence (212INT2308)

Course Category: Honours Elective

CourseType: Theory

**COURSE OBJECTIVES:**

- The structure of agents
- The learning mechanisms of agents
- The communication and cooperation within agents
- The design of agents

**COURSE OUTCOMES:**

**CO1.** Implement a computational agent with various searching techniques

**CO2.** Apply the reasoning mechanisms of proposition and predicate logic to agents

**CO3.** Use the learning mechanisms for an artificial agent.

**CO4.** Execute different communication and co-operation methodologies in a multi-agent setup.

**CO5.** Know about the agents design.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| **CO\SO** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 2 | 3 | | 1 | | |
| **CO3** | 3 | | 2 | | | 1 |
| **CO4** | | | 1 | 3 | 2 | |
| **CO5** | 1 | | | 2 | 3 | |

**COURSE TOPIC(S)**

**UNIT 1: INTRODUCTION**

Agents as a paradigm for software engineering - Agents as a tool for understanding human societies- Intelligent Agent: Agents and Objects - Agents and Expert Systems - Agents as Intentional Systems - Abstract Architectures for Intelligent Agents - How to Tell an Agent What to Do

**UNIT 2: LEARNING IN AGENTS**

Proportional case - Handling variables and qualifiers - Dealing with intractability - Reasoning with horn clauses - Procedural control of reasoning - Rules in production – Reasoning with Higherorder Logics.

**UNIT 3: COMMUNICATION AND COOPERATION IN AGENTS**

Software tools for ontology - OWL - XML - KIF - Speech acts - Cooperative Distributed ProblemSolving - Task Sharing and Result Sharing - Result Sharing - Combining Task and Result Sharing- Handling Inconsistency - Coordination - Multi agent Planning and Synchronization

**UNIT 4: DEVELOPING INTELLIGENT AGENT SYSTEMS**

Situated Agents: Actions and Percepts - Proactive and Reactive Agents: Goals and Events- Challenging Agent Environments: Plans and Beliefs - Social Agents - Agent Execution Cycle - Deciding on the Agent Types - Grouping functionalities - Review Agent Coupling - AcquaintanceDiagrams - Develop Agent Descriptors

**UNIT 5: APPLICATIONS**

Agent for workflow and business process management- Mobile agents - Agents for distributed systems - agents for information retrieval and management - agents for electronic commerce - agent for human- computer interface - agents for virtual environments - agents for social simulation.

**TEXT BOOKS:**

1. Michael Wooldridge, "An Introduction to Multi Agent Systems", Second Edition, JohnWiley and Sons, 2009.
2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Pearson Education, 2009.

3. Lin Padgham, Michael Winikoff, “Developing Intelligent Agent Systems: A Practical Guide”,Wiley publications, 2005

**REFERENCES:**

1. Ronald Brachman, Hector Levesque , “Knowledge Representation and Reasoning”, TheMorgan Kaufmann Series in Artificial Intelligence 2004
2. Arthur B. Markman, “Knowledge Representation”, Lawrence Erlbaum Associates,1998

213INT3105: COMPUTATIONAL LINGUISTICS

<table>
<tr><td rowspan="2">213INT3105</td><td rowspan="2">COMPUTATIONAL LINGUISTICS</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td colspan="8">Prerequisite: Python for Programming and Product Development (211CSE1401)<br>Course Category: Honours Elective<br>CourseType: Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- Learn about the statistical modeling and classification for NLP
- Learn the basic techniques of information retrieval
- Know about the basics of text mining
- Learn the generic issues in speech processing and applications relevant tonatural language generation

**COURSE OUTCOMES:**

**CO1.** Develop applications related to speech processing.

**CO2.** To know about the basic techniques of information retrieval.

**CO3.** Develop applications related to text mining.

**CO4.** Know about the generic issues in speech processing.

**CO5.** Develop applications relevant to natural language generation

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 2 | 3 | 1 | | | 1 |
| **CO3** | 3 | | 2 | | | |
| **CO4** | 1 | | | 2 | 2 | |
| **CO5** | 3 | | | 3 | 1 | |

**COURSE TOPIC(S)**

**UNIT 1: NATURAL LANGUAGE PROCESSING**

Linguistic background - spoken language input and output technologies - Written language input- Mathematical methods - Statistical modeling and classification - Finite state methods: Grammar for NLP - Parsing - Semantic interpretation: Semantics and logical form - Ambiguity Resolution - Other strategies for semantic interpretation - Word Sense Disambiguation - Named Entity Recognition

**UNIT 2: INFORMATION RETRIEVAL**

Information Retrieval architecture - Indexing - Storage - Compression techniques - Retrieval approaches - Evaluation - Search Engines - Commercial search Engine features - comparison - Performance measures - Document processing - NLP based Information Retrieval - Information Extraction - Vector Space Model

**UNIT 3: TEXT MINING**

Categorization : Extraction based Categorization - Clustering - Hierarchical clustering - Flat Clustering - Document classification and routing - Finding and organizing answers from text search - Categories and clusters for organizing retrieval results - Text Categorization - Efficient summarization using lexical chains - Pattern extraction

**UNIT 4: GENERIC ISSUES**

Multilinguality - Multilingual Information Retrieval and Speech Processing - Multimodality- Text and Images - Modality Integration - Transmission and storage - Speech coding - Evaluation of systems - Human factors and user acceptability.

**UNIT 5: APPLICATIONS**

Machine translation - Transfer metaphor - Interlingua and statistical approaches - Discourse processing - Dialog and conversational agents - Natural language generation - Surface Realizationand discourse planning

**TEXT BOOKS:**

1. Daniel Jurafsky, James H. Martin, " Speech and Language Processing", Pearson Education,2009.
2. Ronald Cole, J.Mariani, et.al, "Survey of the state of the art in human language Technology",Cambridge University Press, 1997.

3. Michael W.Berry, " Survey of Txt Mining: Clustering, Classification and Retrieval",SpringerVerlag, 2004.

**REFERENCES:**

1. James Allen, "Natural Language Understanding", Second Edition, Pearson Education, 2008.
2. Gerald J.Kowalski, Mark. T. Maybury, " Information Storage and Retrieval systems" , KluwerAcademic Publishers, 2000.
3. TomekStrzalkowski, " Natural Language Information Retrieval", Kluwer AcademicPublishers, 2009.

213INT1111: E-LEARNING TECHNIQUES

<table>
<tr><td rowspan="2">213INT1111</td><td rowspan="2">E-LEARNING TECHNIQUES</td><td>L</td><td>T</td><td>P</td><td>X</td><td>C</td><td>H</td></tr>
<tr><td>4</td><td>0</td><td>0</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td colspan="8">Prerequisite: Nil<br>Course Category: Honours Elective<br>CourseType: Theory</td></tr>
</table>

**COURSE OBJECTIVES:**

- To gain knowledge about modern technology for learning.
- To be acquainted with e-Learning Tools.
- To learn technologies involved in e-learning application development.
- To become aware of the current business potential of e-learning basedbusiness

**COURSE OUTCOMES:**

**CO1.** Work with technologies involved in e-Learning Applications

**CO2.** Design and Develop e-Learning Application

**CO3.** Know about the E-Learning tools.

**CO4.** Develop web based E-learning methods.

**CO5.** Know about the learning methodology.

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | |
| **CO2** | 2 | | | | | 3 |
| **CO3** | | 2 | | 1 | | 1 |
| **CO4** | 3 | 3 | 3 | | | |
| **CO5** | 2 | | | 2 | 3 | 3 |

**COURSE TOPIC(S)**

**UNIT 1: INTRODUCTION**

Definition – Benefits – Challenges & opportunities- Developing E-learning-E-learning approachesE-learning components-Synchronous and asynchronous e-learning-Quality of e-learning-Blended learning- ROI metrics & evaluation – E-Learning cycle – Learning strategy – Business drivers – Elearning strategy.

**UNIT 2: DESIGN**

Identifying and organizing course content-Needs analysis- Analyzing the target audienceIdentifying course content-Defining learning objectives-Defining the course sequence- Defining instructional, media, evaluation and delivery strategies-Defining instructional methods, Defining the delivery strategy, Defining the evaluation strategy. Instructional design – Design issues – Types of learning engagements – Blended learning – Team – Infra structure – Vendor relationships.

**UNIT 3: CREATING INTERACTIVE CONTENT**

Multi-channel delivery – Learner support – Developing curriculum – E-learning standards – Content development process- Creating storyboards-Structure of an interactive e-lesson Techniques for presenting content-Integrating media elements-Courseware development Authoring tools-Types of authoring tools-Selecting an authoring tool.

**UNIT 4: WEB BASED TRAINING**

Definition – Need for web based training – Choosing an approach – Kind of courses – Technical standards – Metaphors – Course framework – registration – Running the course – resources – Feedback – Access – Collaborative learning- Moodle and other open-source solutions – E- learningmethods.

**UNIT 5: LEARNING METHODOLOGY**

Organizing learning sequences – Common lesson structures – Creating building blocks – Designing learning sequences – Learning activities – Test and exercise learning – Planning tests – Selecting questions – Sequencing test questions – Feedback – Improve testing – Prevent cheating.

**TEXT BOOKS:**

1. Clark, R. C. and Mayer, R. E. , “ eLearning and the Science of Instruction”. PHI 3rd edition,2011
2. Means, B., Toyama, Y., and Murphy, R. “Evaluation of Evidence-Based Practices in OnlineLearning: A Meta-Analysis and Review of Online Learning Studies”, 2010

**REFERENCES:**

1. 1 Crews, T. B., Sheth, S. N., and Horne, T. M ”Understanding the Learning Personalities of Successful Online Students” Educause Review. Jan/Feb 2014.
2. MadhuriDubey,‖Effective “E-learning Design,Development and Delivery”,University Press2011.

213INT3106: HETEROGENOUS COMPUTING

| 213INT3106 | HETEROGENOUS COMPUTING | L<br>4 | T<br>0 | P<br>0 | X<br>0 | C<br>4 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Computer Organization and Assembly Language Programming (212INT1101)<br>Course Category: Honours Elective<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn about the development of massively parallel systems
- To learn about the challenges in heterogeneous processing systems
- Learn to program heterogeneous systems
- Learn to provide effective parallel solutions for GPGPU architectures

**COURSE OUTCOMES:**

**CO1.** Identify parallelism in an application

**CO2.** Choose the right parallel processing paradigm for a given problem

**CO3.** Devise solutions for an application on a heterogeneous multi-core platform

**CO4.** Program using CUDA and Open MP

**CO5.** Know about the effective parallel solutions for GPGPU architectures

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | 3 |
| **CO2** | 2 | 3 | 1 | | | |
| **CO3** | 3 | | 2 | 1 | | |
| **CO4** | 2 | | | 3 | | 2 |
| **CO5** | 1 | | | 2 | 1 | |

**COURSE TOPIC(S)**

**UNIT 1: PARALLEL COMPUTING BASICS**

Importance of parallelism – Processes, tasks and threads - Modifications to von-Neumann model – ILP, TLP - Parallel hardware – Flynns classification – Shared memory and distributed memoryarchitectures - Cache Coherence - Parallel software – Performance – Speedup and scalability – Massive parallelism - GPUs - GPGPUs

**UNIT 2: SHARED MEMORY PROGRAMMING WITH OpenMP**

OpenMP program structure - OpenMP Clauses and directives – Scheduling primitives – Synchronization primitives – Performance issues with caches - Case study – Tree Search

**UNIT 3: PROGRAMMING GPUS**

GPU architectures - Data parallelism - CUDA Basics – CUDA program structure - Threads, Blocks, Grids - Memory handling

**UNIT 4: PROGRAMMING WITH CUDA**

Parallel patterns – Convolution – Prefix sum – Sparse matrix-vector multiplication – Imaging casestudy

**UNIT 5: OTHER GPU PROGRAMMING PLATFORMS**

Introduction to Open CL – Open ACC – C++AMP – Thrust – Programming Heterogeneous clusters – CUDA and MPI

**TEXT BOOKS:**

1. Peter Pacheco, ―Introduction to parallel programming‖, Morgan Kauffman, 2011.
2. David B. Kirk, Wen-mei W. Hwu, ―Programming massively parallel processors‖, MorganKauffman, 2013, 2nd Edition

**REFERENCES:**

1. Shane Cook, ―CUDA Programming – A developers guide to parallel computing with GPUs‖,Morgan Kauffman, 2013.
2. B.R. Gaster, L. Howes, D.R. Kaeli, P. Mistry, D. Schaa, ― Heterogeneous computing withOpenCL‖, Morgan Kauffman, 2012.

213INT3107: PATTERN RECOGNITION

| 213INT3107 | PATTERN RECOGNITION | L | T | P | X | C | H |
|---|---|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 0 | 4 | 4 |

Prerequisite: Data Warehousing and Mining (213INT1305)

Course Category: Honours Elective

CourseType: Theory

**COURSE OBJECTIVES:**

- To know about supervised and unsupervised Learning.
- To study about feature extraction and structural pattern recognition.
- To explore different classification models.
- To learn about fuzzy pattern classifiers and perception

**COURSE OUTCOMES:**

**CO1.** Classify the data and identify the patterns

**CO2.** Extract feature set and select the features from given data set.

**CO3.** Learn about feature extraction and structural pattern recognition

**CO4.** Know about the different classification models

**CO5.** Know about fuzzy pattern classifiers and perception

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | 2 | | |
| **CO2** | 2 | 3 | | 1 | 1 | |
| **CO3** | | | 1 | | | |
| **CO4** | 1 | | 2 | | | 2 |
| **CO5** | 3 | | | 3 | | |

**COURSE TOPIC(S)**

**UNIT 1: PATTERN CLASSIFIER**

Overview of Pattern recognition – Discriminant functions – Supervised learning – Parametric estimation – Maximum Likelihood Estimation – Bayesian parameter Estimation – Problems withBayes approach– Pattern classification by distance functions – Minimum distance pattern classifier.

**UNIT 2: CLUSTERING**

Clustering for unsupervised learning and classification – Clustering concept – C Means algorithm – Hierarchical clustering – Graph theoretic approach to pattern Clustering – Validity of Clusters.

**UNIT 3: FEATURE EXTRACTION AND STRUCTURAL PATTERN RECOGNITION**

KL Transforms – Feature selection through functional approximation – Binary selection - Elements of formal grammars - Syntactic description - Stochastic grammars - Structural representation.

**UNIT 4: HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINE**

State Machines – Hidden Markov Models – Training – Classification – Support vector Machine – Feature Selection.

**UNIT 5: RECENT ADVANCES**

Fuzzy logic – Fuzzy Pattern Classifiers – Pattern Classification using Genetic Algorithms –Case Study Using Fuzzy Pattern Classifiers and Perception.

**TEXT BOOKS:**


1. M. Narasimha Murthy and V.Susheela Devi, ―Pattern Recognition‖, Springer 2011.
2. S.Theodoridis and K.Koutroumbas, ―Pattern Recognition‖, 4th Edition., Academic Press, 2009


**REFERENCES:**


1. Robert J.Schalkoff, ―Pattern Recognition Statistical, Structural and Neural Approaches‖, JohnWiley & Sons Inc., New York, 1992.
2. C.M.Bishop,―Pattern Recognition and Machine Learning‖, Springer, 2006.
3. R.O.Duda, P.E.Hart and D.G.Stork, ―Pattern Classification‖, John Wiley, 2001.
4. Andrew Webb, ―Stastical Pattern Recognition‖, Arnold publishers, London, 1999

213INT3103: VISUALIZATION TECHNIQUES

| 213INT4103 | VISUALIZATION TECHNIQUES | L<br>3 | T<br>1 | P<br>0 | X<br>0 | C<br>4 | H<br>4 |
|---|---|---|---|---|---|---|---|
| Prerequisite: Artificial Intelligence (212INT2308)<br>Course Category: Honours Elective<br>CourseType: Theory | | | | | | | |

**COURSE OBJECTIVES:**

- To learn about the importance of data visualization.
- To know the different types of visualization techniques.
- To create various visualizations

**COURSE OUTCOMES:**

**CO1.** Compare various visualization techniques.

**CO2.** Design creative visualizations

**CO3.** Apply visualization over different types of data.

**CO4.** Study about types of visualization.

**CO5.** Create various visualizations

**MAPPING OF COURSE OUTCOMES (CO) WITH ABET STUDENT OUTCOMES (SO)**

| CO\SO | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 |
|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | | | | |
| **CO2** | 2 | 3 | 1 | | | |
| **CO3** | | | 2 | 3 | | 1 |
| **CO4** | 3 | | | 2 | 2 | |
| **CO5** | 1 | | | | | 3 |

**COURSE TOPIC(S)**

**UNIT 1: INTRODUCTION**

Introduction – Issues – Data Representation – Data Presentation – Common Mistakes in design.

**UNIT 2: FOUNDATIONS FOR DATA VISUALIZATION**

Visualization stages – Experimental Semiotics based on Perception Gibson‗s Affordance theory-A Model of Perceptual Processing – power of visual perception-Types of Data-visualization and data objects.

**UNIT 3: COMPUTER VISUALIZATION**

Non-Computer Visualization – Computer Visualization: Exploring Complex Information Spaces-Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3Ddata –Interacting with visualization

**UNIT 4: MULTIDIMENSIONAL VISUALIZATION**

One Dimension – Two Dimensions – Three Dimensions – Multiple Dimensions – Trees – WebWorks – Data Mapping: Document Visualization – Workspaces.

**UNIT 5: CASE STUDIES**

Small interactive calendars – Selecting one from many – Web browsing through a key hole –Communication analysis – Archival analysis

**TEXT BOOKS**:


1. Colin Ware, ―Information Visualization Perception for Design‖ MargonKaufmannPublishers, 2004, 2nd edition.
2. Robert Spence ―Information visualization – Design for interaction‖, Pearson Education, 2 ndEdition, 2007
3. Stephen Few, ―Information Dashboard Design-The Effective Visual Communication of Data‖: O'Reilly Media Publisher,1st Edition 2006


**REFERENCES:**


1. 1.Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, ―Readings in Information Visualization Using Vision to think‖, Morgan Kaufmann Publishers. 2008

# KALASALINGAM

**ACADEMY OF RESEARCH & EDUCATION**

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