Design and Analysis of Algorithms

Course Title: Design and Analysis of Algorithms
Course No: CSC314
Nature of the Course: Theory + Lab
Semester: V

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: This course introduces basic elements of the design and analysis of computer algorithms. Topics include asymptotic notations and analysis, divide and conquer strategy, greedy methods, dynamic programming, basic graph algorithms, NP-completeness, and approximation algorithms. For each topic, beside in-depth coverage, one or more representative problems and their algorithms shall be discussed.

Course Objectives:

- Analyze the asymptotic performance of algorithms.
- Demonstrate a familiarity with major algorithm design techniques
- Apply important algorithmic design paradigms and methods of analysis.
- Solve simple to moderately difficult algorithmic problems arising in applications.
- Able to demonstrate the hardness of simple NP-complete problems

Course Contents:

Unit 1: Foundation of Algorithm Analysis (4)

1.1. Algorithm and its properties, RAM model, Time and Space Complexity, detailed analysis of algorithms (Like factorial algorithm), Concept of Aggregate Analysis
1.2. Asymptotic Notations: Big-O, Big-Ω and Big-Θ Notations their Geometrical Interpretation and Examples.
1.3. Recurrences: Recursive Algorithms and Recurrence Relations, Solving Recurrences (Recursion Tree Method, Substitution Method, Application of Masters Theorem)

Unit 2: Iterative Algorithms (4)

2.1. Basic Algorithms: Algorithm for GCD, Fibonacci Number and analysis of their time and space complexity
2.2. Searching Algorithms: Sequential Search and its analysis
2.3. Sorting Algorithms: Bubble, Selection, and Insertion Sort and their Analysis

Unit 3: Divide and Conquer Algorithms (8)

3.1. Searching Algorithms: Binary Search, Min-Max Finding and their Analysis
3.2. Sorting Algorithms: Merge Sort and Analysis, Quick Sort and Analysis (Best Case, Worst Case and Average Case), Heap Sort (Heapify, Build Heap and Heap Sort Algorithms and their Analysis), Randomized Quick sort and its Analysis
3.3. Order Statistics: Selection in Expected Linear Time, Selection in Worst Case Linear Time and their Analysis.

Unit 4: Greedy Algorithms (6)

4.1. Optimization Problems and Optimal Solution, Introduction of Greedy Algorithms, Elements of Greedy Strategy.
4.2. Greedy Algorithms: Fractional Knapsack, Job sequencing with Deadlines, Kruskal's Algorithm, Prims Algorithm, Dijkstra's Algorithm and their Analysis
4.3. Huffman Coding: Purpose of Huffman Coding, Prefix Codes, Huffman Coding Algorithm and its Analysis

Unit 5: Dynamic Programming (8)

5.1. Greedy Algorithms vs Dynamic Programming, Recursion vs Dynamic Programming, Elements of DP Strategy

5.2. DP Algorithms: Matrix Chain Multiplication, String Editing, Zero-One Knapsack Problem, Floyd Warshwall Algorithm, Travelling Salesman Problem and their Analysis.

5.3. Memoization Strategy, Dynamic Programming vs Memoization

Unit 6: Backtracking (5)

6.1. Concept of Backtracking, Recursion vs Backtracking

6.2. Backtracking Algorithms: Subset-sum Problem, Zero-one Knapsack Problem, N-queen Problem and their Analysis.

Unit 7: Number Theoretic Algorithms (5)

7.1. Number Theoretic Notations, Euclid's and Extended Euclid's Algorithms and their Analysis.

7.2. Solving Modular Linear Equations, Chinese Remainder Theorem, Primility Testing: Miller-Rabin Randomized Primility Test and their Analysis

Unit 8: NP Completeness (5)

8.1. Tractable and Intractable Problems, Concept of Polynomial Time and Super Polynomial Time Complexity

8.2. Complexity Classes: P, NP, NP-Hard and NP-Complete

8.3. NP Complete Problems, NP Completeness and Reducibility, Cooks Theorem, Proofs of NP Completeness (CNF-SAT, Vertex Cover and Subset Sum)

8.4. Approximation Algorithms: Concept, Vertex Cover Problem, Subset Sum Problem

Laboratory Work:

This course can be learnt in effective way only if we give focus is given in practical aspects of algorithms and techniques discussed in class. Therefore student should be able to implement the algorithms and analyze their behavior. Students should:

- Implement comparison sorting algorithms and perform their empirical analysis.
- Implement divide-and-conquer sorting algorithms and perform their empirical analysis.
- Implement algorithms for order statistics and perform their empirical analysis.
- Implement algorithms by using Greedy, DP and backtracking paradigm
- Implement NP-complete problems and realize their hardness.

Recommended Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to algorithms", Third Edition.. The MIT Press, 2009.
2. Ellis Horowitz, Sartaj Sahni**,** Sanguthevar Rajasekiaran, "Computer Algorithms", Second Edition, Silicon Press, 2007.
3. Kleinberg, Jon, and Eva Tardos**, "** Algorithm Design**" ,** Addison-Wesley**,** First Edition, 2005

System Analysis and Design

Course Title: System Analysis and Design
Course No: CSC315
Nature of the Course: Theory + Lab
Semester: V

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: This course familiarizes students with the concepts of information systems development including systems development life cycle, different approaches to systems development, project management, planning, analysis, design, implementation and maintenance. This course also covers some fundamental concepts of object oriented systems analysis and design.

Course Objectives: The main objective of this course is to provide knowledge of different concepts of system analysis and design so that students will be able to develop information systems using different methodologies, tools, techniques, and approaches.

Course Contents:

Unit 1: Foundations for Systems Development (10 Hrs.)

1.1. The Systems Development Environment: Introduction; A Modern Approach to Systems Analysis and Design; Developing Information Systems and the Systems Development Life Cycle; The Heart of the Systems Development Process and Traditional Waterfall SDLC; CASE Tools

1.2. Other Approaches: Prototyping; Spiral; Rapid Application Development; Introduction to Agile Development

1.3. Managing the Information Systems Project: Introduction; Managing the Information Systems Project; Representing and Scheduling Project Plans; Using Project Management Software

Unit 2: Planning (5 Hrs.)

2.1. Identifying and Selecting Systems Development Projects: Introduction; Identifying and Selecting Systems Development Projects; Corporate and Information Systems Planning

2.2. Initiating and Planning Systems Development Projects: Introduction; Initiating and Planning Systems Development Projects; Process of Initiating and Planning IS Development Projects, Assessing Project Feasibility; Building and Reviewing the Baseline Project Plan

Unit 3: Analysis (13 Hrs.)

3.1. Determining System Requirements: Introduction; Performing Requirements Determination; Traditional Methods for Determining Requirements; Contemporary Methods for Determining System Requirements; Radical Methods for Determining System Requirements

3.2. Structuring System Process Requirements: Introduction; Process Modeling; Data Flow Diagrams; Modeling Logic with Decision Tables, Decision Trees, and Pseudocodes

3.3. Structuring System Data Requirements: Introduction; Conceptual Data Modeling; Gathering Information for Conceptual Data Modeling; Introduction to E-R Modeling

Unit 4: Design (7 Hrs.)

4.1. Designing Databases: Introduction; Database Design; Relational Database Model; Normalization; Transforming E-R Diagrams Into Relations; Merging Relations; Physical File and Database Design; Designing Fields; Designing Physical Tables

4.2. Designing Forms and Reports: Introduction; Designing Forms and Reports; Formatting Forms and Reports; Assessing Usability

4.3. Designing Interfaces and Dialogues: Introduction; Designing Interfaces and Dialogues; Interaction Methods and Devices; Designing Interfaces; Designing Dialogues; Designing Interfaces and Dialogues in Graphical Environments

Unit 5: Implementation and Maintenance (4 Hrs.)

5.1. System Implementation: Introduction, System Implementation, Software Application Testing, Installation, Documenting the System, Training and Supporting Users, Organizational Issues in Systems Implementation

5.2. Maintaining Information Systems: Introduction, Maintaining Information Systems, Conducting Systems Maintenance

Unit 6: Introduction to Object-Oriented Development (6 Hrs.)

Basic Characteristics of Object-Oriented Systems; Object-Oriented System Analysis and Design (OOSAD); Introduction to Unified Modeling Language, Structural and Behavioral Diagrams

Laboratory / Project Work: In the practical session, students will learn to use project management, CASE, and modeling tools. They also prepare a project report that includes at least analysis, design, and implementation phases of system analysis and design. The project can be done in groups with at most four members in each group using any suitable database, programming, and interfacing technologies.

Text Books:

1. Joseph S. Valacich and Joey F. George, *Modern Systems Analysis and Design*, 8th Edition, Pearson
2. Alan Dennis, Barbara Haley Wixom, and David Tegarden, Systems Analysis and Design – An Object-Oriented Approach with UML, 5th Edition, Wiley

References Books:

1. Kenneth E. Kendall and Julie E. Kendall, System Analysis and Design, 9th Edition, Pearson
2. Jeffrey Whitten and Lonnie Bently, System Analysis and Design Methods, 7th Edition
3. Scott Tilley and Harry J. Rosenblatt, System Analysis and Design, 11th Edition

Cryptography

Course Title: Cryptography
Course No: CSC316
Nature of the Course: Theory + Lab
Semester: V

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: The course introduces the underlying the principles and design of cryptosystems. The course covers the basics concepts of cryptography including: traditional ciphers, block ciphers, stream ciphers, public and private key cryptosystems. The course also includes the theory of hash functions, authentication systems, network security protocols and malicious logic.

Course Objectives: The objectives of this course are to familiarize the students with cryptography and its applications. The students will be able to develop basic understanding of cryptographic mechanisms.

Course Contents:

Unit I: Introduction and Classical Ciphers (7 hr)

1.4. Security: Computer Security, Information Security, Network Security, CIA Triad, Cryptography, Cryptosystem, Cryptanalysis, Security Threats and Attacks, Security Services, Security Mechanisms
1.5. Classical Cryptosystems:
Substitution Techniques: Ceasar, Monoalphabetic, Playfair, Hill, Polyalphabetic ciphers, One-time pad
Transposition Techniques: Rail Fence Cipher
1.6. Modern Ciphers: Block vs. Stream Ciphers, Symmetric vs. Asymmetric Ciphers

Unit II: Symmetric Ciphers (10 hr)

2.4. Fiestel Cipher Structure, Substitution Permutation Network (SPN)
2.5. Data Encryption Standards (DES), Double DES, Triple DES
2.6. Finite Fields: Groups Rings, Fields, Modular Arithmetic, Euclidean Algorithm, Galois Fields (GF(p) & $GF(2^n)$), Polynomial Arithmetic
2.7. International Data Encryption Standard (IDEA)
2.8. Advanced Encryption Standards (AES) Cipher
2.9. Modes of Block Cipher Encryptions (Electronic Code Book, Cipher Block Chaining, Cipher Feedback Mode, Output Feedback Mode, Counter Mode)

Unit III: Asymmetric Ciphers (8 hr)

3.4. Number Theory: Prime Numbers, Fermat's Theorem, Euler's Theorem, Primility Testing, Miller-Rabin Algorithm, Extended Euclidean Theorem, Discrete Logarithms
3.5. Public Key Cryptosystems, Applications of Public Key Cryptosystems
3.6. Distribution of public key, Distribution of secret key by using public key cryptography, Diffie-Helman Key Exchange, Man-in-the-Middle Attack
3.7. RSA Algorithm
3.8. Elgamal Cryptographic System

Unit IV: Cryptographic Hash Functions and Digital Signatures (8 hr)

4.4. Message Authentication, Message Authentication Functions, Message Authentication Codes
4.5. Hash Functions, Properties of Hash functions, Applications of Hash Functions
4.6. Message Digests: MD4 and MD5
4.7. Secure Hash Algorithms: SHA-1 and SHA-2

4.8. Digital Signatures: Direct Digital Signatures, Arbitrated Digital Signature
4.9. Digital Signature Standard: The DSS Approach, Digital Signature Algorithm
4.10. Digital Signature Standard: The RSA Approach

Unit V: Authentication (3 Hrs)
5.4. Authentication System,
5.5. Password Based Authentication, Dictionary Attacks,
5.6. Challenge Response System,
5.7. Biometric System
5.8. Needham-Schroeder Scheme, Kerberos Protocol

Unit VI: Network Security and Public Key Infrastructure (6 Hrs)
6.1. Overview of Network Security
6.2. Digital Certificates and X.509 certificates, Certificate Life Cycle Management
6.3. PKI trust models, PKIX
6.4. Email Security: Pretty Good Privacy (PGP)
6.5. Secure Socket Layer (SSL) and Transport Layer Security (TLS)
6.6. IP Security (IPSec)
6.7. Firewalls and their types

Unit VI: Malicious Logic (3 Hrs)
7.1. Malicious Logic, Types of Malicious Logic: Virus, Worm, Trojan Horse, Zombies, Denial of Service Attacks,
7.2. Intrusion, Intruders and their types, Intrusion Detection System

Laboratory Works:
The laboratory work includes implementing and simulating the concepts of cryptographic algorithms, hash functions, digital signatures, network security protocols and malicious logic. Students are free to use any of the language and platform as per the skills.

Text Book:
1. W. Stallings, *Cryptography and Network Security*, Pearson Education.

Reference Books:

1. William Stallings, *Network Security, Principles and Practice.*
2. Matt Bishop, *Computer Security, Art and Science*.
3. Mark Stamp, *Information Security: Principles and Practices.*
4. Bruce Schneier, *Applied Cryptography*.
5. Douglas. R. Stinson. *Cryptography: Theory and Practice.*
6. B. A. Forouzan, *Cryptography & Network Security*, Tata Mc Graw Hill.

Simulation and Modeling

Course Title: Simulation and Modeling
Course No: CSC317
Nature of the Course: Theory + Lab
Semester: V

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: The syllabus consists of introduction to system, modeling and simulation of different types of systems. It includes the modeling of systems, its validation, verification and analysis of simulation output. It comprises the concept of queuing theory, random number generation as well as study of some simulation languages.

Course Objective: To make students understand the concept of simulation and modeling of real time systems.

Course Contents:

Unit 1: Introduction to Simulation (6 Hours)
System and System Environment, Components of System, Discrete and Continuous System, System Simulation, Model of a System, Types of Model, Use of Differential and Partial differential equations in Modeling, Advantages, Disadvantages and Limitations of Simulation, Application Areas, Phases in Simulation Study

Unit 2: Simulation of Continuous and Discrete System (7 Hours)
Continuous System Models, Analog Computer, Analog Methods, Hybrid Simulation, Digital-Analog Simulators, Feedback Systems
Discrete Event Simulation, Representation of time, Simulation Clock and Time Management, Models of Arrival Processes - Poisson Processes, Non-stationary Poisson Processes, Batch Arrivals; Gathering statistics, Probability and Monte Carlo Simulation

Unit 3: Queuing System (6 Hours)
Characteristics and Structure of Basic Queuing System, Models of Queuing System, Queuing notation, Single server and Multiple server Queueing Systems, Measurement of Queueing System Performance, Elementary idea about networks of Queuing with particular emphasis to computer system, Applications of queuing system

Unit 4: Markov Chains (2 Hours)
Features, Process Examples, Applications

Unit 5: Random Numbers (7 Hours)
Random Numbers and its properties, Pseudo Random Numbers, Methods of generation of Random Number, Tests for Randomness - Uniformity and independence, Random Variate Generation

Unit 6: Verification and Validation (4 Hours)
Design of Simulation Models, Verification of Simulation Models, Calibration and Validation of the models, Three-Step Approach for Validation of Simulation Models, Accreditation of Models

Unit 7: Analysis of Simulation Output (4 Hours)
Confidence Intervals and Hypothesis Testing, Estimation Methods, Simulation run statistics, Replication of runs, Elimination of initial bias

Unit 8: Simulation of Computer Systems (9 Hours)
Simulation Tools, Simulation Languages: GPSS, Case Studies of different types of Simulation Models and Construction of sample mathematical models

Laboratory Work:
Practical should include the simulation of some real time systems (continuous and discrete event systems), Queuing Systems, Random Number generations as well as study of Simulation Tools and Language

Text Book:

1. Jerry Banks, John S. Carson, Barry L. Nelson, David M. Nicole, "Discrete Event system simulation", 5th Edition, Pearson Education

Reference Books:

1. Geoffrey Gordon: System Simulation
2. Law, "Simulation Modeling and Analysis", 5th Edition, McGraw-Hill

Web Technology

Course Title: Web Technology
Course No: CSC318
Nature of the Course: Theory + Lab
Semester: V

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: This course covers the fundamental concepts of HTML, CSS, JavaScript, XML, and PHP.

Course Objectives: The main objective of this course is to provide basic knowledge of web design using HTML and CSS, client side scripting using JavaScript, handling web data using XML and server side scripting using PHP.

Course Contents:

Unit 1: Introduction (3 Hrs.)
Web Basics: Internet, Intranet, WWW, Static and Dynamic Web Page; Web Clients; Web Servers; Client Server Architecture: Single Tier, Two-Tier, Multi-Tier; HTTP: HTTP Request and Response; URL, Client Side Scripting, Server Side Scripting, Web 1.0, Web 2.0

Unit 2: Hyper Text Markup Language (10 Hrs.)
Introduction to HTML; Elements of HTML Document; HTML Elements and HTML Attributes, Headings, Paragraph, Division, Formating: b, i, small, sup, sub; Spacing: Pre, Br; Formatting Text Phrases: span, strong, tt; Image element; Anchors; Lists: Ordered and Unordered and Definition; Tables; Frames; Forms: Form Elements, ID attributes, Class Attributes of HTML Elements; Meta Tag, Audio, Video, Canvas, Main, Section, Article, Header, Footer, Aside, Nav, Figure Tags; HTML Events: Window Events, Form Element Events, Keyboard Events, Mouse Events

Unit 3: Cascading Style Sheets (8 Hrs.)
Introduction; Cascadding Style Sheets (CSS); CSS Syntax; Inserting CSS: Inline, Internal, External, ID and Class Selectors; Colors; Backgrounds; Borders; Text; Font; List; Table; CSS Box Model; Normal Flow Box Layout: Basic Box Layout, Display Property, Padding, Margin; Positioning: Relative, Float, Absolute; CSS3 Borders, Box Shadows, Text Effects and shadow; Basics of Responsive Web Designs; Media Queries, Introduction to Bootstrap

Unit 4: Client Side Scripting with JavaScript (9 Hrs.)
Structure of JavaScript Program; Variables and Data Types; Statements: Expression, Keyword, Block; Operators; Flow Controls, Looping, Functions; Popup Boxes: Alert, Confirm, Prompt; Objects and properties; Constructors; Arrays; Built-in Objects: Window, String, Number, Boolean, Date, Math, RegExp, Form, DOM; User Defined Objects; Event Handling and Form Validation, Error Handling, Handling Cookies, jQuery Syntax; jQuery Selectors, Events and Effects; Introduction to JSON

Unit 5: AJAX and XML (7 Hrs.)
Basics of AJAX; Introduction to XML and its Application; Syntax Rules for creating XML document; XML Elements; XML Attributes; XML Tree; XML Namespace; XML schema languages: Document Type Definition(DTD), XML Schema Definition (XSD); XSD Simple Types, XSD Attributes; XSD Complex Types; XML Style Sheets (XSLT), XQuery

Unit 6: Server Side Scripting using PHP (8 Hrs.)
PHP Syntax, Variables, Data Types , Strings, Constants, Operators, Control structure, Functions, Array, Creating Class and Objects, PHP Forms, Accessing Form Elements, Form Validation,

Events, Cookies and Sessions, Working with PHP and MySQL, Connecting to Database, Creating, Selecting, Deleting, Updating Records in a table, Inserting Multiple Data, Introduction to CodeIgniter, Laravel, Wordpress etc.

Laboratory Works:
The laboratory work includes creating web pages and applications with using HTML, CSS, JavaScript, XML, and PHP. Students have to prepare a web based application, using above mentioned technologies, as a project work.

Text Books:

1. Web Design with HTML, CSS, JavaScript and jQuery Set, Jon Duckett, *John Wiley & Sons*
2. Web Technologies: A Computer Science Perspective, Jeffrey C. Jackson , *Pearson Prentice Hall*
3. Learning PHP, MySQL & JavaScript: with jQuery, CSS & HTML5, Robin Nixon, *O'Reilly*
4. PHP & MySQL: Server-side Web Development, Jon Ducket, *Wiley*

Reference Books:

1. HTML5 and CSS3 for the Real World", Estelle Weyl, Louis Lazaris, Alexis Goldstein, *Sitepoint*
2. HTML & CSS: Design and Build Websites, Jon Duckett, *John Wiley & Sons*
3. Dynamic Web Programming and HTML5, Paul S. Wang, *CRC Press*
4. HTML5 Programming with JavaScript for Dummies, John Paul Mueller
5. JavaScript and JQuery: Interactive Front-end Web Development, Jon Duckett, *Wiley*
6. The Complete Reference: HTML and CSS, Thomas A. Powell, *Mc Graw Hill*
7. JavaScript: The Web Technologies Series, Don Gosseli, *Course Technology Cengage Learning*
8. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and AJAX, Black Book, *Dreamtech Press*
9. An Introduction to XML and Web Technologies, Anders Møller and Michael I. Schwartzbach, *Addison-Wesley*
10. PHP and MySQL Web Development, Luke Welling, *Addison Wesley*
11. www.w3schools.com

Wireless Networking

Course Title: Wireless Networking
Course No: CSC320
Nature of the Course: Theory + Lab
Semester: V

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: This course familiarizes students with different concepts of wireless networking including wireless channels, communication techniques, cellular communications, mobile network, and advanced features.

Objective: The main objective of this course is to provide concepts and principles of wireless networking including protocol stacks and standards with the evolution of latest wireless networks.

Unit 1: Introduction **[4Hrs]**

1.1 History and challenges of wireless communications
1.2 WLAN technologies: Infrared, UHF narrowband, spread spectrum
1.3 Wireless communications standards

Unit 2: Wireless Channel Characterization **[4Hrs]**

2.1 Multipath propagation environment
2.2 LTI channel model
2.3 Channel correlation function
2.4 Large scale path loss
2.5 Small scale multipath fading

Unit 3: Wireless Communication Techniques **[12Hrs]**

3.1 Transmission techniques
  3.1.1 Introduction to bandpass transmission
  3.1.2 Signal space and decision reasons
  3.1.3 Digital modulation
  3.1.4 Power spectral density
3.2 Receiver Techniques
  3.2.1 Introduction to fading dispersive channels
  3.2.2 Channel impairment mitigation techniques
  3.2.3 Diversity
  3.2.4 Channel equalization
3.3 Multiple Access Technologies
  3.3.1 Conflict free multiple access technologies
  3.3.2 Spectral efficiencies

Unit 4: Fundamental of Cellular Communications **[5Hrs]**

4.1 Spectrum reuse and re-farming
4.2 Cell cluster concept
4.3 Co-channel and adjacent channel interference
4.4 Cell site call blocking and delay
4.5 Channel allocation strategies

Unit 5: Mobility Management in Wireless Networks **[6Hrs]**

5.1 Introduction
5.2 Call admission control
5.3 Handoff management

5.4 Location management for cellular and PCS networks
5.5 Traffic calculation

Unit 6: Overview of Mobile Network and Transport Layer [8Hrs]

6.1 Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation
6.2 IPv6-Network layer in the internet
6.3 Mobile IP session initiation protocol
6.4 Wireless application protocol
6.5 Mobile routing protocols: DSDV, AODV and DSR
6.6 Classical TCP improvements: Mobile TCP, Time out freezing, Selective retransmission

Unit 7: Advances in Wireless Networking [6Hrs]

7.1 4G: Features, Challenges and Applications
7.2 Overview of 4G Technologies
- 7.2.1 Multicarrier Modulation
- 7.2.2 Smart antenna techniques
- 7.2.3 Adaptive Modulation
- 7.2.4 Cognitive Radio

7.3 Introduction to 5G and its vision
7.4 Introduction to wireless network virtualization
7.5 Concepts of Wireless Sensor Network & RFID
7.6 Introduction to optical communication: Li-Fi
7.7 Introduction to Software Defined Wireless Networks
7.8 Concepts of Open BTS and Open Cellular Networks

Laboratory Works:

1. Implement DSSS, Channel coding, line coding in MATLAB or equiv. tool
2. Analyze performance of WiMAX/WiFi network using NetSim or equiv. tool.
3. Develop QPSK detector and understand the relation between BER and SNR.
4. Implement various pulse shaping filers implemented in wireless communication.
5. Implement wireless routing protocol: DSDV & AODV
6. Create IPv6 based (Ad-hoc & Infrastructure) wireless network environment and evaluate connectivity, delay, latency, throughput etc.
7. Understand Contiki OS and implement IoT/WSN

Recommended Books:

1. Vijay Garg. "Wireless Communications and networking", First Edition, Elsevier 2007
2. John W. Mark and Weisua Zhuang. "Wireless communications and Networing", Prentice hall of India Pvt. Ltd., 2005
3. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012
4. Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education 2013