
# Bachelor of Technology

(Four Year Full Time Degree Program)

SYLLABUS

(B. Tech Fourth Year)

## School of Computer Science and Engineering

## Shri Mata Vaishno Devi University Katra

**(April 2018)**

| | **ABBREVIATIONS / CODES / NOMENCLATURE** |
|---|---|
| | |
| | |
| **Course Code Convention** | |
| SCT – LSAY<br><br>Example<br>ALL 9101<br>ALP 9102<br>ALS 9110 | Course Code for various Courses / Subjects<br>SC: School Code<br>T: Course Type Code (Lecture/Studio/Practical/Project etc.)<br>L: Course Level (1, 2, 3, 4 & 5 for First, Second years …)<br>SA: Study Area / Sub Area<br>Y: Semester Wise Course Number |
| CSE | School Code (SoCSE) |
| L | Lecture |
| P | Practical |
| E | Elective |
| C | Colloquium |
| D | Project Based |
| T | Training |
| S | Self Study |
| N | Non Credit |
| V | Special Lecture Topic |
| **Teaching Scheme Convention** | |
| L | Lecture |
| T | Tutorial |
| P | Practical |
| C | Course Credit |
| **Evaluation Scheme Convention** | |
| Minor | (Mid Term Exams / Tests) I & II |
| Major | Semester End Examination (ESE) |
| FFCS | Fully Flexible Credit System |
| CBCS | Choice Based Credit System |

## Teaching & Examination Scheme

| | | | B. Tech Semester-V (Fall), Fourth Year | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Teaching & Credits Scheme | | | | | | Evaluation & Examination Scheme | | | | | |
| **S. No** | **Subject Code** | **Title of the Subject** | **L** | **T** | **P** | | **Total Periods /week** | **C** | **Minor E Duration (Hours)** | **Major E Duration (Hours)** | **Internal Marks** | **Minor Marks (I+II)** | **Major Marks** | **Total Marks** |
| 1 | CSL 4001 | Colloquium | 0 | 3 | 0 | | | 3 | 1.5 | 3 | 10 | 40 | 50 | 100 |
| 2 | CSL 4141 | Mobile Communication | 3 | 0 | 0 | | | 3 | 1.5 | 3 | 10 | 40 | 50 | 100 |
| 3 | CSL 4121 | Computer Network Security | 3 | 0 | 0 | | | 3 | 1.5 | 3 | 10 | 40 | 50 | 100 |
| 4 | CSL 4110 | Data Science & Analytics | 3 | 0 | 0 | | | 3 | 1.5 | 3 | 10 | 40 | 50 | 100 |
| 5 | CSL 4053 | Compiler Design | 3 | 1 | 0 | | | 4 | 1.5 | 3 | 10 | 40 | 50 | 100 |
| 6 | | School Elective - III | 3 | 0 | 0 | | | 3 | 1.5 | 3 | 10 | 40 | 50 | 100 |
| 7 | | Open Elective IV (HM) | 3 | 0 | 0 | | | 3 | 1.5 | 3 | 10 | 40 | 50 | 100 |
| 8 | CSD 4002 | Mini Project | 0 | 0 | 6 | | | 3 | - | - | - | - | | |

## Teaching & Examination Scheme

| | | | B. Tech Semester- VIII (winter), Fourth Year | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Teaching & Credits Scheme | | | | | | Evaluation & Examination Scheme | | | | | |
| **S. No** | **Subject Code** | **Title of the Subject** | **L** | **T** | **P** | | **Total Periods/ week** | **C** | **Minor E Duration (Hours)** | **Major E Duration (Hours)** | **Internal Marks** | **Minor Marks (I+II)** | **Major Marks** | **Total Marks** |
| 1 | CSD 4083 | Major Project + Open Elective IV (8+3) / Internship (11) | | | | | | 11 | | | | | | 100 |

| **CSC 4001** | | | **Colloquium** | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
| L | T | P | C | Minor Duration | Major Duration | Internal Marks | Minor-I Marks | Minor-II Marks | Major Marks | Total Marks |
| 0 | 3 | 0 | 3 | 1.5 Hours | 3.0 Hours | 10 | 20 | 20 | 50 | 100 |

## COURSE OBJECTIVES

a. To expose students to the 'real' working environment and get acquainted with the organization structure, business operations and administrative functions.
b. To set the stage for future recruitment by potential employers.

## COURSE OUTCOMES

- Demonstrate knowledge of mathematics, science and engineering.
- Demonstrate the ability to identify, formulate and solve engineering problems.
- Demonstrate the ability to design and conduct experiments, analyze and interpret data.
- Demonstrate the ability to design a system, component or process as per needs and specifications.
- Demonstrate the ability to visualize and work on laboratory and multi-disciplinary tasks.
- Demonstrate the skills to use modern engineering tools, software's and equipment to analyze problems.
- Demonstrate the knowledge of professional and ethical responsibilities.
- Be able to communicate effectively in both verbal and written form.
- Show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.
- Develop confidence for self education and ability for life-long learning.
- Show the ability to participate and try to succeed in competitive examinations.

| CSL 4141 | | | Mobile Communication | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
| L | T | P | C | Minor Duration | Major Duration | Internal Marks | Minor-I Marks | Minor-II Marks | Major Marks | Total Marks |
| 3 | 0 | 0 | 3 | 1.5 Hours | 3.0 Hours | 10 | 20 | 20 | 50 | 100 |

## COURSE OBJECTIVE

1. To make students familiar with fundamentals of mobile communication systems
2. To choose system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of
3. Transmission, channel properties etc.
4. To identify the requirements of mobile communication as compared to static communication
5. To identify the limitations of 2G and 2.5G wireless mobile communication and use design of 3G
6. and beyond mobile communication systems
7. As a prerequisite for the course in Wireless LANs

## COURSE CONTENTS

**Unit I:**

Wireless Communication Fundamentals

Introduction – Wireless transmission – Frequencies for radio transmission – Signals –Antennas – Signal propagation – Multiplexing – Modulations – Spread spectrum –MAC – SDMA – FDMA – TDMA – CDMA –Cellular wireless networks.

**Unit II :**

Telecommunication Networks

Telecommunication systems – GSM – GPRS – DECT – UMTS – IMT–2000 –Satellite networks – Basics – Parameters and configurations – Capacity allocation –FAMA and DAMA – Broadcast systems – DAB – DVB.

**Unit III:**

Wireless LAN

Wireless LAN – IEEE 802.11 – Architecture – Services – MAC – Physical layer –IEEE 802.11a – 802.11b standards – HIPERLAN – Blue tooth.

**Unit IV:**

Mobile Network Layer

Mobile IP – Dynamic host configuration protocol – Routing – DSDV – DSR–Alternative metrics.

**Unit V:**

Transport And Application Layers

Traditional TCP – Classical TCP improvements – WAP – WAP 2.0.

**Recommended Books**

1) Mobile communications by Raj Kamal

2) Mobile & pervasive computing by Sandeep Gupta & Frank Adelstein

## COURSE OUTCOMES

1. To make students familiar with various generations of mobile communications
2. To understand the concept of cellular communication
3. To understand the basics of wireless communication
4. Knowledge of GSM mobile communication standard, its architecture, logical channels, advantages and limitations.
5. Knowledge of IS-95 CDMA mobile communication standard, its architecture, logical channels, advantages and limitations.
6. Knowledge of 3G mobile standards and their comparison with 2G technologies.
7. To under multicarrier communication systems.
8. To differentiate various Wireless LANs.

| CSL 4121 | | | Computer Network Security | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
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## COURSE OBJECTIVE

1. To make students familiar with fundamentals of mobile communication systems

2. To choose system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of transmission, channel properties etc.

3. To identify the requirements of mobile communication as compared to static communication

4. To identify the limitations of 2G and 2.5G wireless mobile communication and use design of 3G and beyond mobile communication systems

## COURSE CONTENTS

### Unit I

Introduction

Attacks on computers and computer security, need for security, approaches , principles, types of attacks ,operational model of network security

Cryptography concepts and techniques, substitution, transposition, encryption and decryption, symmetric, Asymmetric key cryptography, key range size, possible type of attacks**.**

### Unit II

Mathematics of cryptography and DES

Block ciphers modes, feistel ciphers DES. working of DES ,cracking des ,problems on des., 2DES, 3DES, des design ,Side channel attacks, Differential cryptanalysis.

### Unit III

Symmetric-Key Cryptography**:** Glosis field theory, AES, overview of Rijndael - comparison with others. Symmetric ciphers, Blowfish in practice ,RC4, RC5,RC6,IDEA, RSA

### Unit IV

Asymmetric-Key Cryptography

RSA, Elliptic curve cryptography ECC, Digital certificates and PKI.

### Unit V

Cryptographic Hash Functions

Hashing schemes SHA-family, MAC, Digital Signature RSA El Gomel , DSS DSA, Authentication Protocols , applications Kerberos, X.509 Directory services

**Unit VI**

Network Security

Internet security protocols , SSL,TLS TSP WAP security, SET Hashing Authentication & Signature Schemes E-mail security, Email architecture SSL, PGP, MIME, S/MIME

Internet Protocol Security ( IPSec) IPSec architecture, IPSec verses other layers security Mobile IPSec, VPN, Web security SSL, TLS, SET etc

**Unit VII**

System Security

Intruders, types of attacks, protecting against Intruders honeypots, scanning and analysis tools, Viruses and worms, types of viruses, protection, Firewall architecture implementing firewalls, xml firewalls, trusted systems, trusted system applications, multi-level security, trusted products. Security implementation, wireless security, securities in Adhoc-networks.

**SUGGESTED BOOKS:**

1. Cryptography and Network Security

Behrouz A. Forouzan, TMH

**2.** Cryptography And Network Security

Principles and Practices William Stallings, Prentice Hall

3. Cryptography and Network Security

Atul Kahate, Tata McGraw-Hill.

**Course Outcomes:**

Upon completion of the Course:

1. Get the basic knowledge about different methods of conventional encryption.
2. Get knowledge about the concepts of public key encryption and number theory.
3. Acquire knowledge about authentication functions, message authentication codes and different hash algorithms.
4. Acquire knowledge about network security tools and authentication applications.
5. Write programs to illustrate real time use and evaluation of security algorithms

| CSL 4110 | | | Data Science & Analytics | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
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**Course Objective**

More and more organizations these days use their data a decision supporting tool and to build data-intensive products and services. The collection of skills required by organizations to support these functions has been grouped under the term "Data Sciences". This course will cover the basic concepts of big data, methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and the business needs. The course is intended for second degree students coming for a background of: Engineering, computer sciences, statistics, mathematics, economy and management.

**Course Contents**

**Unit 1**

**Introduction: What is Data Science?**

Big Data and Data Science hype {and getting past the hype Why now? {Data creation, Current landscape of perspectives, Skill sets needed}

**Unit II**
**Statistical Inference**

Populations and samples, Statistical modeling, probability distributions, getting a model, Intro to R

**Unit III**
**Exploratory Data Analysis and the Data Science Process**

Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: RealDirect (online real estate rm)

**Unit IV**

**Three Basic Machine Learning Algorithms**

Linear Regression, K-Nearest Neighbors (k-NN), K-means

**Unit V**

**One More Machine Learning Algorithm and Usage in Applications**

Motivating application: Filtering Spam

Why Linear Regression and k-NN are poor choices for Filtering Spam

Naive Bayes and why it works for Filtering Spam

Data Wrangling: APIs and other tools for scrapping the Web

**Unit VI**

**Feature Generation and Feature Selection (Extracting Meaning From Data)**

Motivating application: user (customer) retention

Feature Generation (brainstorming, role of domain expertise, and place for imagination)

Feature Selection algorithms

{ Filters; Wrappers; Decision Trees; Random Forests

**Unit VII**

**Recommendation Systems: Building a User-Facing Data Product**

Algorithmic ingredients of a Recommendation Engine

Dimensionality Reduction

Singular Value Decomposition

Principal Component Analysis

Exercise: build your own recommendation system

**Unit VII**
**Mining Social-Network Graphs**

Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs

Partitioning of graphs, Neighborhood properties in graphs

**Unit VIII**
**Data Visualization**

Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects, Exercise: create your own visualization of a complex dataset

**Unit IX**
**Data Science and Ethical Issues**

Discussions on privacy, security, ethics, A look back at Data Science, Next-generation data, Scientists

**Suggested Books:**

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

Jure Leskovek, Anand Rajaraman and Je rey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)

**COURSE OUTCOMES**

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

1. Describe what Data Science is and the skill sets needed to be a data scientist.
2. Use R to carry out basic statistical modeling and analysis.
3. Explain the significance of exploratory data analysis (EDA) in data science. Apply basic tools (plots, graphs, summary statistics) to carry out EDA.
4. Describe the Data Science Process and how its components interact.
   Use APIs and other tools to scrap the Web and collect data.
5. Apply EDA and the Data Science process in a case study.
6. Apply basic machine learning algorithms.
7. Create effective visualization of given data (to communicate or persuade).

| **CSL 4053** | | | **Compiler Design** | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
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**COURSE OBJECTIVE**

The main objectives of these courses are to give students hands-on experience with crafting a simple compiler, working on a sizeable software engineering project, using modern software tools, and most importantly correlating theory with practice.

**COURSE CONTENTS**

**Unit I**

**Introduction**: Issues related to programming Language Design, Issues relatd to Finite-State Machines, Phases of Compiler Design, Lexical Analysis, Error Detection and Recovery.

Basic Parsing Techniques**:** Parsers, Shift-Reduced Parsers, Operator-Precedence Parsing, Predictive Parsers.

**Unit II**

**Top-Down Parsing, Bottom-up Parsing:** LL(1) Grammars, Recursive Descent Parsers, LR Grammars – Concepts and Terminology, LR(O) Parsers, SLR(1) Parsers, Canonical LR(1) Parsers, LALR(1) Parsers, using ambiguous grammar. Attributed Translation Grammar, L-Attributed Translation Grammar.

**Unit III**

**Syntax-Directed Translation (SDT):** SDT Schemes, Implementation of SDTs, Intermediate Code, Parse Trees and Syntax Trees. Three Address Code, Quadruples and Triples. Translation schemes for Declarations, Assignment statements, Boolean Expressions, Flow of control statements, Array references in Arithmetic Expressions, Procedure Calls, Case Statements, and |Structures.

**Unit IV**

**Semantic Analysis & Type Checking:** Introduction, Implicit-Stacking in Recursive Descent Compilation, Semantic Stacks in Bottom-up Compilation, Action-Symbols in Top-Down Compilation, Type Expressions, Overloaded Functions, Polymorphic Functions.

**Unit V**

**Symbol Table Handling Techniques:** When to construct and Interact with the symbol Table, Symbol-Table Contents, Operations on symbol Table. Symbol Table organizations for Block – Structured Languages.

**Unit VI**

**Run-Time Storage Organization and Management:** Static Storage Allocation, Dynamic Storage Allocation, Heap Storage Allocation, Garbage Collection and Compaction.

**Unit VII**

**Code Optimization:** Principal sources of Optimization, Loop Optimization, Loop-Invariant Computation, Induction variable elimination, Other Loop Optimizations, The DAG representation of Basic Blocks. Global Data – Flow Analysis.

**Unit VIII**

**Code Generation:** Object programs, Problems Code Generation, A simple Code Generator. Register Allocation and Optimization, Code Generation from DAG, PEECPhole optimization.

**Recommended Books:**

1. Principles of Compiler Design; A. V. Aho & J. D. Ullman Narosa
2. The Theory and Practice of Compiler Writing, J Tremblay and Paul G. S.

**Suggested Books:**

1. Principles of compiler design A.V Aho & J.D Ulmann
2. Compiler design principles by Ashish

**COURSE OUTCOMES**

1. Apply the knowledge of lex tool & yacc tool to devleop a scanner & parser.
2. To design & conduct experiments for Intermediate Code Generation in compiler.
3. To design & implement a software system for backend of the compiler.
4. To deal with different translators.
5. To develop program to solve complex problems in compiler
6. To learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
7. To acquire the knowledge of modern compiler & its features.
8. To learn & use the new tools and technologies used for designing a compiler
9. To use the knowledge of patterns, tokens & regular expressions for solving a problem in the field of data mining.

| **CSE 4090** | | | **Multimedia and Virtual Reality Elective III** | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
| L | T | P | C | Minor Duration | Major Duration | Internal Marks | Minor-I Marks | Minor-II Marks | Major Marks | Total Marks |
| 3 | 0 | 0 | 3 | 1.5 Hours | 3.0 Hours | 10 | 20 | 20 | 50 | 100 |

## COURSE OBJECTIVE

1. To give each student a firm grounding in the fundamentals of the underpinning technologies in graphics, distributed systems and multimedia
2. To teach students about the principled design of effective media for entertainment, communication, training and education
3. To provide each student with experience in the generation of animations, virtual environments and multimedia applications, allowing the expression of creativity
4. To provide each student with a portfolio of their own completed work at the end of the programme

## COURSE CONTENTS

### UNIT-I

### INTRODUCTION

Concept of Non- Temporal and Temporal Media. Basic Characteristics of Non-Temporal Media; Images, Graphics, Text. Basic Characteristics of Temporal Media: Video, Audio, and Animation. Hypertext and Hypermedia. Presentations: Synchronization, Events, Scripts and Interactivity, Introduction to Authoring Systems.

### UNIT-II

### COMPRESSION TECHNIQUES

Basic concepts of Compression. Still Image Compression: JPEG Compression. Features of JPEG2000. Video Compression: MPEG- 1&2 Compression Schemes, MPEG-4 Natural Video Compression. Audio Compression: Introduction to speech and Audio Compression, MP3 Compression Scheme. Compression. Of synthetic. Graphical objects.

### UNIT-III

### MULTIMEDIA SYSTEMS ARCHITECTURE

General Purpose Architecture for Multimedia Support: Introduction to Multimedia PC/Workstation Architecture, Characteristics of MMX instruction set, I/O systems: Overview of USB port and IEEE 1394 interface, Operating System Support for Multimedia

Data: Resource Scheduling with real-time considerations, File System, I/O Device Management.

### UNIT-IV

### MULTIMEDIA INFORMATION MANAGEMENT

Multimedia Database Design, Content Based Information Retrieval: Image Retrieval, Video Retrieval, Overview of MPEG-7, Design of video-on-Demand Systems.

**Unit V**

**Introduction to Virtual Reality and Virtual Reality Systems, Related Technologies**

Teleoperation and Augmented Reality Systems Interface to the Virtual World-Input; Head and hand trackers, data globes, hap tic input devices. Interface to the Virtual World- Output, Stereo display, head-mounted display, auto-stereoscopic displays, holographic displays, hap tic and force feedback.

**Unit VI**

**VRML Programming**

Modeling objects and virtual environments Domain Dependent applications: Medical, Visualization, Entertainment, etc.

Suggested Text Books:-

1. Multimedia System Design, Andleigh and Thakarar , PHI

2. Multimedia Technology & Application, David Hillman, Galgotia Publications.

Reference Books: –

1. Multimedia Computing Communication and Application, Steinmetz, Pearson Edn.
2. Virtual Reality Systems , John Vince, Pearsn Education.
3. Fundamentals of Computer Graphics and Multimedia, D.P. Mukherjee, PHI

**COURSE OUTCOMES**

1. Demonstrate knowledge and understanding of the concepts, principles and theories of Multimedia Applications and Virtual environments
2. Demonstrate knowledge and understanding of the current issues involved with development and deployment of multimedia system
3. Analyse and solve problems related to their expertise in Multimedia Applications and Virtual Environments.
4. Demonstrate their ability to extend their basic knowledge to encompass new principles and practice
5. Demonstrate their computing, technical and theoretical skills by developing a substantial Multimedia application.
6. Plan, conduct and report on the development of an Multimedia Application
7. Engage in independent research
8. Communicate the results of study and research, both in writing and orally

| **CSE 4223** | | | **High Performance Computing (Elective III)** | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
| L | T | P | C | Minor Duration | Major Duration | Internal Marks | Minor-I Marks | Minor-II Marks | Major Marks | Total Marks |
| 3 | 0 | 0 | 3 | 1.5 Hours | 3.0 Hours | 10 | 20 | 20 | 50 | 100 |

## COURSE OBJECTIVE

The objective of this course is to learn how to improve the quality of the programs that you write for execution on high performance computer systems.

The course discusses the various activities that happen during program execution, and how they are managed by the hardware (architectural features) and system software (operating systems, run-time systems).

## COURSE CONTENTS

**Unit I**

Program execution

Program, Compilation, Object files, Function call and return, Address space, Data and its representation

**Unit I**

Computer organization

Memory, Registers, Instruction set architecture, Instruction processing

**Unit II**

Pipelined processors: Pipelining, Structural, data and control hazards, Impact on programming

**Unit III**

Virtual memory: Use of memory by programs, Address translation, Paging

**Unit IV**

Cache memory: Organization, impact on programming, virtual caches

**Unit V**

Operating systems: Processes and system calls, Process management

**Unit VI**

Program profiling

**Unit VII**

File systems: Disk management, Name management, Protection

**Unit VIII**

Parallel architecture: Inter-process communication, Synchronization, Mutual exclusion, Basics of parallel architecture, Parallel programming with message passing using MPI

## COURSE OUTCOMES

To pass, the student should be able to

- Transform algorithms in the computational area to efficient programming code for modern computer architectures
- Write, organise and handle programs for scientific computations
- Use tools for performance optimisation and debugging
- Analyse code with respect to performance and suggest and implement performance improvements
- Report on performance analysis in clear and correct writing.

| **CSE 3074** | | | **Wireless Networks Elective III** | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
| L | T | P | C | Minor Duration | Major Duration | Internal Marks | Minor-I Marks | Minor-II Marks | Major Marks | Total Marks |
| 3 | 0 | 0 | 3 | 1.5 Hours | 3.0 Hours | 10 | 20 | 20 | 50 | 100 |

**Course Objectives:**

1. To study about Wireless networks, protocol stack and standards.
2. To study about fundamentals of 3G Services, its protocols and applications.
3. To study about evolution of 4G Networks, its architecture and applications.

**Course Contents**

**UNIT I**

**Wireless LAN**
Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security – IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

**UNIT II**

**Mobile Network Layer**
Introduction – Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol – mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing

**UNIT III**

**Mobile Transport Layer**
TCP enhancements for wireless protocols – Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility – Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP – TCP over 3G wireless networks.

**UNIT IV**

**Wireless Wide Area Network**
Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

**UNIT V**

**4G Networks**
Introduction – 4G vision – 4G features and challenges – Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

**Text Books:**

Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012.(Unit I,II,III)
Vijay Garg , "Wireless Communications and networking", First Edition, Elsevier 2007.(Unit IV,V)

**References:**

Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.

Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier 2011.

Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education 2013

## COURSE OUTCOMES

Upon completion of the course, the students will be able to

1. Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
2. Design and implement wireless network environment for any application using latest wireless protocols and standards.
3. Implement different type of applications for smart phones and mobile devices with latest network strategies.

| **CSE 4017** | | | **Digital Forensics** | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
| L | T | P | C | Minor Duration | Major Duration | Internal Marks | Minor-I Marks | Minor-II Marks | Major Marks | Total Marks |
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**Course Objective**

The course covers both the principles and practice of digital forensics. Societal and legal impact of computer activity: computer crime, intellectual property, privacy issues, legal codes; risks, vulnerabilities, and countermeasures; methods and standards for extraction, preservation, and deposition of legal evidence in a court of law. This course provides hands-on experience in different computer forensics situations that are applicable to the real world. Students will learn different aspects of digital evidence: ways to uncover illegal or illicit activities left on disk and recovering files from intentionally damaged media with computer forensics tools and techniques.

**Course Contents**

**Unit I**

Introduction to Computer Forensics: computer crimes, evidence, extraction, preservation, etc.

**Unit II**

Overview of hardware and operating systems: structure of storage media/devices; windows/Macintosh/ Linux -- registry, boot process, file systems, file metadata.

**Unit III**

Data recovery: identifying hidden data, Encryption/Decryption, Steganography, recovering deleted files.

**Unit IV**

Digital evidence controls: uncovering attacks that evade detection by Event Viewer, Task Manager, and other Windows GUI tools, data acquisition, disk imaging, recovering swap files, temporary &cache files

**Unit V**

Computer Forensic tools: Encase, Helix, FTK, Autopsy, Sleuth kit Forensic Browser, FIRE, Found stone Forensic ToolKit, WinHex, Linux dd and other open source tools.

**Unit VI**

Network Forensic: Collecting and analyzing network-based evidence, reconstructing web browsing, e-mail activity, and windows registry changes, intrusion detection, tracking offenders, etc.

**Unit VII**

Mobile Network Forensic: Introduction, Mobile Network Technology, Investigations, Collecting Evidence, Where to seek Digital Data for further Investigations, Interpretation of Digital Evidence on Mobile Network.

**Unit VIII**

Software Reverse Engineering: defend against software targets for viruses, worms and other malware, improving third-party software library, identifying hostile codes-buffer overflow, provision of unexpected inputs, etc.

**Unit IX**

Computer crime and Legal issues: Intellectual property, privacy issues, Criminal Justice system for forensic, audit/investigative situations and digital crime scene, investigative procedure/standards for extraction, preservation, and deposition of legal evidence in a court of law.

**Suggested Textbook:**

1. Digital Forensics with Open Source Tools. Cory Altheide and Harlan Carvey, ISBN: 978-1-59749-586-8, Elsevier publication, April 2011
2. Computer Forensics and Cyber Crime: An Introduction (3rd Edition) by Marjie T. Britz, 2013.

**Reference Books:**

1. Network Forensics: Tracking Hackers Through Cyberspace, Sherri Davidoff, Jonathan Ham Prentice Hall, 2012

1. Guide to Computer Forensics and Investigations (4th edition). By B. Nelson, A. Phillips, F. Enfinger, C. Steuart. ISBN 0-619-21706-5, Thomson, 2009.

2. Computer Forensics: Hard Disk and Operating Systems, EC Council, September 17, 2009
3. Computer Forensics Investigation Procedures and response, EC-Council Press, 2010
4. EnCase Computer Forensics., 2014
5. File System Forensic Analysis. By Brian Carrier. Addison-Wesley Professional, March 27, 2005.

**COURSE OUTCOMES**

1. Conduct digital investigations that conform to accepted professional standards and are based on the investigative process: identification, preservation, examination, analysis and reporting
2. Cite and adhere to the highest professional and ethical standards of conduct, including impartiality and the protection of personal privacy
3. Identify and document potential security breaches of computer data that suggest violations of legal, ethical, moral, policy and/or societal standards
4. Apply a solid foundational grounding in computer networks, operating systems, file systems, hardware and mobile devices to digital investigations and to the protection of computer network resources from unauthorized activity
5. Work collaboratively with clients, management and/or law enforcement to advance digital investigations or protect the security of digital resources
6. Access and critically evaluate relevant technical and legal information and emerging industry trends
7. Communicate effectively the results of a computer, network and/or data forensic analysis verbally, in writing, and in presentations to both technical and lay audiences

| **CSD 4083** | | | **Major Project** | | | | Pre Requisites | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version R-01 | | | | | | | Co-requisites | | | |
| L | T | P | C | Minor Duration | Major Duration | Internal Marks | Minor-I Marks | Minor-II Marks | Major Marks | Total Marks |
| | | | 11 | | | | | | | 100 |

**COURSE OUTCOMES**

- Students should be able to design and construct a hardware and software system, component, or process to meet desired needs.
- Students are provided to work on multidisciplinary Problems.
- Students should be able to work as professionals, with portfolio ranging from data management, network configuration, designing hardware, database and software design to management and administration of entire systems.