Ubiquitous Computing (CS60055)
Course Outline

Lecture 1:

- Introduction to Ubiquitous Computing
- Three waves of computing
- Key elements of Ubiquitous computing
- Common myths about ubiquitous computing
- Challenges of Ubiquitous Computing
- Designing good Ubiquitous System

Lecture 2:

- Introduction to wireless technologies
- Advantages of using wireless technologies for ubiquitous computing

- Multiplexing
    - Space Division Multiplexing
    - Frequency Division Multiplexing
    - Time Division Multiplexing
    - Code Division Multiplexing

Lecture 3:

- Multiplexing
    - Space Division Multiplexing
    - Frequency Division Multiplexing
    - Time Division Multiplexing
    - Code Division Multiplexing
- Modulation
    - Amplitude Shift Keying
    - Frequency Shift Keying
    - Phase Shift Keying
    - Multi Carrier Modulation

Lecture 4:

- Spread Spectrum
    - Direct Sequence Spread Spectrum
    - Frequency Hopping Spread Spectrum
- Medium Access Control
    - Hidden and Exposed Terminal
    - Near and Far Terminal

Lecture 5:

- Medium Access Control
    - FDMA
    - TDMA
    - CDMA
    - Comparison between all the three

Lecture 6:

- Cellular Systems
    - Cell Splitting
    - Sectorization
    - Handoffs
    - Cellular Architecture
    - AMPS
    - GSM

Lecture 7:

- Cellular Systems
    - UMTS
    - IMT 2000
    - Problem with 3G Systems
    - CDMA Based Cellular System
    - TDMA Based Cellular System

Lecture 8:

- Satellite System
    - GEO
    - MEO
    - LEO

- Routing
- Localization
- Handover

Lecture 9:

· Wireless Networks

- Packet Radio Network
- Wireless LAN
- 802.11b
- Bluetooth
- Wireless ATM

Lecture 10:

- Wireless Networks
    - Wireless Application Model
    - WML
    - Zigbee
    - VOLTE/LITE
- Ubiquitous Networks
    - Power Line Communication
    - Personal Area Network
    - Body Area Network
    - Mobile User Networks

Lecture 11:

· Mobile Networking

- Goal and Requirements
- IP Packet Delivery
- Agent Discovery
- Registration

Lecture 12:

· Mobile Networking

- Tunneling and Encapsulation
- Reverse Tunneling
- IPV6

Lecture 13:

· Adhoc Networks

- Introduction
- Challenges in Routing
- Classification of Routing Protocols
- DSDV

Lecture 14:

· Adhoc Networks

- WRP
- OLSR
- DSR
- FSR

Lecture 15:

· Adhoc Networks

- AODV
- ADV
- SHARP
- ZRP

Lecture 16:

· Wireless TCP

- Traditional TCP
- Classical TCP Improvements
- Mobile TCP

Lecture 17:

· Wireless TCP

- Fast Retransmit/ Fast Recovery
- Transmission/ Time Out Freezing
- Selective Retransmission
- Transaction Oriented TCP

Lecture 18:

· Information Management in Ubiquitous Computing

- Rich v/s Lean and Soft v/s Hard Information
- Managing the Multimedia Content

- Managing Data
- Managing Metadata

Lecture 19:

· Location Independent and Location Dependent Computing Modes

- Location Representation
- Infrastructure and Client Based Location System
- Approaches to Determine Location
- Error Reporting

Lecture 20:

· Mobile Applications and Services

- Mobile Agents

- Wireless Web
- Smart Devices
- Smart Environment
- Smart Interaction

Lecture 21:

· Mobile Applications and Services

- Service Oriented Computing
- Service Provision Life Cycle
- Wearable Devices

Lecture 22:

· Mobile Applications and Services

- Service Invocation
- Service Interoperability

Lecture 23:

· Security Management for Ubiquitous Computing

- Types of Security attacks
- Security in GSM architecture
- Security in 2.5G
- Security in 3G

Lecture 24:

· Security Management for Ubiquitous Computing

- Security in 802.11
- Security in MANETS

Lecture 25:

· Security Management for Ubiquitous Computing
    - Protecting RFID Tags
    - Protecting Smart Spaces
    - Protecting Location Information

Lecture 26:

· Context Aware System
    - Modelling Context Aware System
    - Mobility Awareness
    - Context Aware System
    - Spatial Awareness
    - Temporal Awareness

Lecture 27:

· Intelligent systems
    - Types of Intelligent System
    - Intelligence in Ubiquitous Computing
    - Intelligent System Interaction
    - Smart Interaction
    - Smart Human Device Interaction

Lecture 28:

Introduction to Internet of Things
    - Sensing
    - Actuation
    - Basics of networking
    - MQTT
    - AMQP
    - XMPP

Lecture 29:

- SDN for IoT
- Cloud Computing
- Sensor-Cloud
- Fog Computing
- Smart Cities and Smart Homes

Lecture 30:

- Sensor Networks
- Machine-to-Machine Communications
- Interoperability in IoT
- Industrial IoT

Lecture 31:

- IoT for AI/ML application
- Data Handling and Analytics

Lecture 32:

- Introduction of Blockchain
- Working of blockchain
- Components of Blockchain

Lecture 33:

- Various types of blockchain
- Application areas of blockchain
- Blockchain for IoT