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SYLLABUS

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COEN 233 Spring 2022

Network Technology
Dr. Keyvan Moataghed

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1. Introduction to Networks (March-29-2022)

- Network Applications
- Network Concepts
  - Circuit Switching
  - Packet Switching
- Network Types
  - Personal Area Networks
  - Local Area Networks
  - Metropolitan Area Networks
  - Wide Area Networks

2. Network Reference Models (March-31-2022)

- Communication Software Layers
- OSI Reference Model
- TCP/IP Reference Model

3. Physical Layers of Networks (April-05-2022)

- Different Types of Media
  - Twisted Pairs
  - Coaxial
  - Powerline
  - Fiber Optics
  - Electromagnetic Waves
  - Wireless Transmission
    - Electromagnetic Spectrum
    - Radio Transmission
    - Microwave Transmission
    - Infrared Transmission
    - Light Transmission

4. Transmission Concept in Digital Networks (April-07-2022)

- Digital Modulation and Multiplexing
- Baseband Transmission
- Passband Transmission
- Frequency Division Multiplexing

- **Time Division Multiplexing**
- **Code Division Multiplexing**

5. Digital Networks (April-12-2022)

- **Circuit Switched Telephone Network**
  - **Topology**
  - **Local Loop**
  - **Modem**
  - **ADSL**
  - **Fiber**
  - **Trunks and Multiplexing**
  - **Switching**
- **Mobile Telephone Networks**
  - **Analog Voice**
  - **Digital Voice**
  - **Digital Voice + Data**

6. Data Link Layer (April-14-2022)

- **Introduction**
  - **Framing**
  - **Error Control**
  - **Flow Control**
- **Error Detection and correction**
  - **Self Error Correcting Code**
  - **Error Detecting Codes**
- **Communication Concepts**
  - **Utopian Simplex Protocol**
  - **Stop and Wait Protocol for Error Free Channel**
  - **Stop and Wait Protocol for Noisy Channel**
- **Sliding Window**
  - **One-Bit Sliding Window**
  - **Go-Back-N**
  - **Selective Repeat**

7. Data Link Layer Medium Access Control Metods (April-19-2022)

- **Channel Allocation**
  - **Static**
  - **Dynamic**
- **Multiple Access Protocols**
- **Aloha**
- **Carrier Sense Multiple Access**
- **Collision Free Protocol**
- **Ethernet**
  - **Physical Layer**
  - **MAC sublayer**
  - **Switched Ethernet**

- Fast Ethernet
- Gigabit Ethernet

8. Data Link Layer Elements and VLANs (Virtual Local Area Networks) (April-21-2022)

- **Data Link Layer Elements**
  - Bridges (Flooding, Learning)
  - Spanning Tree
  - Hubs
  - Repeaters
- **VLANS (Virtual Local Area Networks)**
  - IEEE 802.ad
  - IEEE 802.ah

9. Data Link Layer for Wireless LAN (Local Area Network) (April-26-2022)

- **Broadband Wireless for Wireless LAN**
  - IEEE 802.11 Architecture and Protocol Stack
  - IEEE 802.11 MAC Layer
  - IEEE 802.11 Frame

10. Data Link Layer for Wireless MAN (Metropolitan Are Network) (April-28-2022)

- **Broadband Wireless for Wireless MAN**
  - IEEE 802.16 Protocol
  - IEEE 802.16 Physical Layer
  - IEEE 802.16 MAC Layer

11. Data Link Layer Medium Access Control for NFC (Near Field cmunication)

*** Midterm*** (Tuesday May-03-2022)

- **Bluetooth**
  - Architecture
  - Protocol
  - Physical Layer
  - Link Layer
  - Frame Structure
- **RFID**
  - EPC (Electronic Product Code) Architecture
  - EPC (Electronic Product Code) Physical Layer
  - EPC (Electronic Product Code) Identification Layer

12. Network Layer Introduction (May-05-2022)

- **Introduction to Routing in Network**
  - Routing concept
  - Connection Oriented Service
  - Connectionless Service
  - Virtual Circuit, Datagram

13. Network Layer Routing Algorithms (May-10-2022

- **Routing Algorithms**
  - **Shortest Path**
  - **Distance Vector**
  - **Link State**
  - **Flooding**
  - **Hierarchical Routing**
  - **Broadcast Routing**
  - **Any Cast Routing**
  - **Routing for Mobile Devices**
  - **Routing in Ad Hoc Networks**
  - **Quality of Service**

14. Network Layer QoS and Congestion Control (May-12-2022)

- **QoS (Quality of Service)**
  - **Traffic Shaping**
  - **Packet Scheduling**
  - **Admission Control**
  - **Methods to Provide QoS**
  - **Intergraded Services**
  - **Differentiated Services**
- **Congestion Control**
  - **Methods to Mitigate Congestion**
  - **Admission Control**
  - **Traffic Throttling**
  - **Load Control (Load Shedding)**

15. Network Layer Addressing, Control Messages and Routing Protocols (May-18-2022)

- **Network Connectivity**
  - **Addressing**
    - **IPV4**
    - **IPV6**
  - **Network Control Message ICMP (Internet Control Message Protocol)**
  - **Address Resolution Protocols**
    - **ARP**
    - **Inverse ARP**
- **Networks-to-Network Connectivity**
  - **Network Tunnels**
  - **Routing between two Networks**
- **Routing Protocols**
  - **OSPF (Open Short Path First)**

- BGP (Boarder Gateway Protocol)
- Multicast

16. Transport Layer (May-19-2022)

- Introduction
  - Serving Application Layer
  - Transport Protocol Concept
  - Berkley Socket
  - Connection Setup
  - Flow Control
  - Error Control
  - Connection Recovery

***ResearchProject Deadline (Sunday May-22-2022) ***

17. Transport Layer Protocols (May-24-2022)

Transport Protocols in Internet

- TCP (Transmission Control Protocol)
  - TCP Protocol Concept
- UDP (User Datagram Protocol)
  - Introduction
  - Remote Procedure Call
- Performance Considerations
  - Introduction
  - Design, Measurement, Compression

18. Application Layer (May-26-2022)

- WWW
- Email
- DNS
- Digital Multimedia
- Audio
- Video

PROGRAMING PROJECTS DEADLINE (Sunday May-29-2022)

19. Security Introduction (May-31-2022)

- Cryptography
- Symmetric Key Algorithm
- Communication Security
  - IPSec
  - Firewall

- Virtual Private Networks

- **Authentication Protocols**
  - **Using shared key**
  - **Using Key Distribution**
  - **Using Kerberos**

20. Security for Applications and Web Access (June-02-2022)

- **Email Security**
  - **PGP (Pretty Good Privacy)**
  - **S/MIME**
- **Web Security**
  - **Threat**
  - **Viruses**
  - **SSL (Secure Socket Layer)**

***** FINAL TEST*****

Final Test (June-07-2022)