Course Outline: Wireless Networking: Architectures, Protocols, and Standards

Lecture 1: Introduction to Wireless Networking
- Overview of wireless communication principles and concepts
- Evolution and history of wireless networks
- Wireless network topologies and architectures
- Challenges and key considerations in wireless networking

Lecture 2: Wireless Transmission Fundamentals
- Wireless propagation models and channel characteristics
- Signal encoding and modulation techniques
- Antennas and radio frequency (RF) systems
- Link budget analysis and system capacity planning

Lecture 3: Wireless LAN Technologies
- IEEE 802.11 standards and protocols
- Wireless LAN architectures and components
- MAC layer protocols: CSMA/CA, RTS/CTS, and more
- Wireless LAN security mechanisms and vulnerabilities

Lecture 4: Cellular Networks and Mobile IP
- Evolution of cellular networks: 1G to 5G
- Cellular network architecture: base stations, mobile switching centers, and more
- Mobile IP: principles and protocols for mobility management
- Handover techniques and call routing in cellular networks

Lecture 5: Wireless Sensor Networks
- Introduction to wireless sensor networks (WSNs)
- Sensor node architecture and energy constraints
- Medium access control (MAC) protocols for WSNs
- Data aggregation and routing algorithms in WSNs

Lecture 6: Ad hoc and Mesh Networks
- Ad hoc network concepts and challenges
- Ad hoc routing protocols: AODV, DSR, and OLSR
- Mesh network architectures and protocols
- Self-organization and network management in ad hoc and mesh networks

Lecture 7: Wireless Network Security
- Threats and vulnerabilities in wireless networks
- Encryption and authentication mechanisms
- Intrusion detection and prevention systems
- Key management and secure protocols for wireless networks

Lecture 8: Mobile Device Management and Internet of Things (IoT)
- Mobile device management (MDM) and mobile application management (MAM)
- Over-the-air (OTA) provisioning and device configuration
- IoT architecture and protocols: MQTT, CoAP, and more
- Integration of wireless networks with IoT systems

Lecture 9: Wireless Network Performance and Optimization
- Performance metrics for wireless networks: throughput, latency, and packet loss
- Quality of Service (QoS) provisioning in wireless networks
- Traffic management and congestion control techniques
- Optimization approaches for improving wireless network performance

Lecture 10: Cognitive Radio and Dynamic Spectrum Access
- Cognitive radio principles and spectrum sensing techniques
- Dynamic spectrum access (DSA) and spectrum management
- Spectrum allocation policies and regulatory considerations
- Applications and future trends in cognitive radio networks

Lecture 11: Next-Generation Wireless Technologies
- 5G and beyond: features and capabilities
- Network slicing and virtualization in 5G networks
- Millimeter wave (mmWave) and massive MIMO technologies
- Ultra-reliable and low-latency communication (URLLC) in 5G

Lecture 12: Case Studies and Emerging Topics
- Case studies of real-world wireless network deployments
- Emerging topics in wireless networking: edge computing, ML, and network slicing
- Research trends and future directions in wireless networking
- Research activities at Stevens' WISELAB