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WIRELESS EMBEDDED NETWORK SYSTEMS

Objectives

- We will learn
  - Fundamentals in Wireless Networks and Communications
  - WLAN IEEE 802.11 Technologies
  - Linux kernel networking
  - Embedded Systems and Linux Wireless Extensions/WEXT
  - Linux WLAN Drivers [Atheros/Broadcom]
  - Wireless Ad-Hoc Routers
  - Advanced topics: IoTs & edge computing, 5G/Smart cities
  - **Major is on both wireless networking knowledge and practical experience via labs/projects!**
- This course is appropriate for
  - Technically oriented people with networking experience

Contents: week-by-week topics

- Course Program consists of:
- **TIME-SLOTS:**
- 01/02: Introduction/Fundamentals of Wireless Networks
- 03: Wireless LANs (IEEE 802.11 standards)
- 04: Linux Kernel Networking
- 05: Embedded Systems and Linux Wireless Extensions
- 06: WLAN drivers Atheros/Broadcom Driver [ath5k/b43]
- 07: Wireless Ad-Hoc Routers
- 08: mid-term {OFF}
- 09-10: Advanced topics: IoTs, edge computing, 5G, Smart cities
- 11-14: Project Presentation
- 15: Review

Contents: week-by-week topics

- **LABS:**
- Introduction to ns-2 (Network Simulator)/Wireless Networks
- Linux kernel source code tree
  - Packet receiving, transmitting, forwarding
  - FIB/Routing tables/Routing caches
  - WLAN drivers/mac80211/cfg80211/nl80211
  - Ad-hoc routing daemons: aodvd/olsrd
  - Quagga/zebra routing software suites

References

- Lecture Notes
- Reference Books
  - William Stallings, *Wireless Communication & Networks*, Prentice Hall, 2nd Edition 2008
  - Sreekrishnan Venkateswaran. *Essential Linux Device Drivers*, 2008
  - K. Wehrle, F. Pählke, H. Ritter, D. Müller, M. Bechler. *Linux® Networking Architecture: Design & Implementation of Network Protocols in the Linux Kernel*, 2004
  - **Quan Le-Trung**, Paal E. Engelstad, Tor Skeie, Frank Eliassen, and Amirhosein Taherkordi, (2011), "Mobility Management for All-IP Mobile Networks," *Book Chapter in "Emerging Wireless Networks: Concepts, Techniques and Applications", ISBN-10: 1439821356 | ISBN-13: 978-1439821350,* CRC Press, Taylor & Francis, US, December 2011.
  - Ivan Stojmenovic, *Handbook of Sensor Networks: Algorithms and Architectures*, WILEY, 2005.
- Standard documents: 802.11, manet, 802.15.4, ZigBee, Mobile IP.
  - IEEE 802.11, http://www.ieee802.org/11/
  - IETF MANET charter, http://www.ietf.org/dyn/wg/charter/manet-charter
  - IEEE 802.15.4, http://www.ieee802.org/15/pub/TG4.html
  - ZigBee, http://www.zigbee.org/

Grading policy [not fixed, modified later]

- 30% projects
- 20% labs
- 50% final exam

Communication

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Apps. Demos on Wireless & Mobile Networks

- **Introduction to Wireless Networking**
  - Demo
- **UWB Radar**
  - Demo