

## SYLLABUS

### NT131–WIRELESS EMBEDDED NETWORK SYSTEMS

#### 1. GENERAL INFORMATION

Course name:	<b>Wireless Embedded Network Systems</b>	
Lecturer:	Quan LE-TRUNG, Assoc. Prof. Dr.techn.	
	Email: <a href="mailto:quanlt@uit.edu.vn">quanlt@uit.edu.vn</a>	
Tutors:		
Credits:	4	
	Theory: 3	Lab: 1
Class hours:	45 hours (1 academic hour: 45 minutes)	
Labs:	30 hours	
Self study:	30 hours	
Prequisites courses/ Pre-known knowledge:		

#### 2. OBJECTIVES

- This course provides the basic concepts of computer networks and data transmission on the network; basic network services, wireless network and network security.

### 3. COURSE BRIEF CONTENTS

This course provides an overview of the concept of computer networks, including the OSI model, TCP/IP model and networking standards; concepts, basic principles of signal, signal transmission. Students learn about the protocols in the network layer and the transport layer. In addition, students also learn the basic network services, wireless network and network security.

### 4. OUTCOME STANDARD

<b>Descriptions</b>	<b>Goals</b>
Communications	G1(1.3.1)
Development of network applications	G2(1.3.2)
Design of wired and wireless mobile networks	G3(1.3.3)
Wireless embedded network systems	G4(1.3.9)
Survey of Print and Electronic Literature, Experimental Inquiry, Hypothesis Test and Defense	G5(2.2.2)
Thinking Holistically	G6(2.3.1)
Prioritization and Focus	G7(2.3.2)
Understanding Needs and Setting Goals	G8(2.4.1)
Development Project Management	G9(2.4.2)
Designing a Sustainable Implementation Process	G10(2.6.1)
Test, Verification, Validation and Certification	G11(2.6.2)
Training and Operations	G12(2.7.2)
Reading/Writing Technical Reports, Documents in English	G13(2.10.1)

## 5. COURSE CONTENTS

Periods	Contents	Goals	Activities
6	<p><b>Chapter 1: Fundamentals in Wireless Transmission</b></p> <p>1.1. Wireless networks: history</p> <p>1.2. Wireless transmission media</p> <p>1.3. Data communication and control in wireless networks: signal, analog vs. digital transmission, channel capacity, multiplexing</p> <p>1.4. Data communication &amp; control: antenna, propagation, attenuation, loss, noise</p>	G1,G2, G3	<p><b>Group formation.</b></p> <p><b>Teaching:</b> lecturer gives instructions, demo, question</p> <p><b>Study in class:</b> exchange related issues, problems.</p>
6	<p><b>Chapter 2: IEEE WLAN 802.11</b></p> <p>2.1. Challenges of wireless communications</p> <p>2.2. MAC functional specification: DCF mode (role in WLANs – infrastructure/ad-hoc networks)</p> <p>2.3. MAC functional specification: DCF mode (role in WLANs – infrastructure/ad-hoc networks)</p> <p>2.4. MAC functional specification: PCF mode</p>	G1,G2, G8,G9, G10	<p><b>Project allocation.</b></p> <p><b>Teaching:</b> lecturer gives instructions, demo, questions, practical/motivation examples.</p> <p><b>Study in class:</b> exchange related issues, problems.</p>
	<p><b>Chapter 3: Linux kernel networking</b></p> <p>3.1. Netfilter</p> <p>3.2. Forwarding Information Base (FIB)</p>		

6	<p>3.3. Routing updates from routing daemons to FIB tables</p> <p>3.4. Packet capture, filter, and processing in Kernel</p>	G4, G8,G9, G10, G12	<p><b>Teaching:</b> lecturer gives instructions, demo, question</p> <p><b>Study in class:</b> exchange related issues, problems.</p>
6	<p><b>Chapter 4: Embedded Systems and WLAN drivers in Linux</b></p> <p>4.1. Embedded systems: Concepts and Applications</p> <p>4.2. Components in Embedded Systems, Processes in development of embedded systems</p> <p>4.3. Real-time Oses in embedded systems</p> <p>4.4. Linux WLAN network drivers</p>	G4, G8,G9, G10, G12	<p><b>Teaching:</b> lecturer gives instructions, demo, question</p> <p><b>Study in class:</b> exchange related issues, problems.</p>
6	<p><b>Chapter 5: WLAN Atheros ath5k</b></p> <p>5.1. Operations</p> <p>5.2. Files and directories</p> <p>5.3. Main data structures and initialization</p> <p>5.4. Flows of function calls for packet processing and network device configuration</p> <p>5.5. Debugging/tracing the operations of driver</p>	G1,G2, G4, G8,G8, G12	<p><b>Teaching:</b> lecturer gives instructions, demo, questions.</p> <p>Discuss in pairs.</p> <p><b>Study in class:</b> exchange related issues, problems.</p>

			Group discussion.
6	<p><b>Chương 6: WLAN Broadcom b43</b></p> <p>6.1. Operations</p> <p>6.2. Files and directories</p> <p>6.3. Main data structures and initialization</p> <p>6.4. Flows of function calls for packet processing and network device configuration</p> <p>6.5. Debugging/tracing the operations of driver</p>	G1,G2, G4, G8, G9, G12	<p><b>Teaching:</b> lecturer gives instructions, demo, questions.</p> <p>Discuss in pairs.</p> <p><b>Study in class:</b> exchange related issues, problems.</p> <p>Group discussion.</p>
9	<p><b>Chapter 7: Design and Implementation of Wireless Ad-hoc Routers</b></p> <p>7.1. Introduction of hardware and software platforms of wireless routers</p> <p>7.2. Components of wireless ad-hoc routers</p> <p>7.3. Linux kernel networking</p> <p>7.4. WLAN network driver</p> <p>7.5. Implementation and deploy the operations of wireless routers</p>	G4,G6, G7,G8, G9, G10, G11, G12	Seminar

## 6. TEACHING & LEARNING METHODOLOGY

Students attend lectures, do assignments and do presentations. Students are encouraged to be creative, to find the research topics and to practice problem solving skill.

## 7. EVALUATION

Format	Goals	Ratio (%)
A1. Projects/Seminar/Assignment	G4, G5→G9, G11	30%
A2. Mid-term		0%
A3. Lab	G1→G6, G10→G13	20%
A4. Final exam	G1, G2, G3, G4	50%

## 8. REFERENCE BOOKS

1. William Stallings, Wireless Communication & Networks, Prentice Hall, 2nd Edition 2008
2. Sreekrishnan Venkateswaran. Essential Linux Device Drivers, 2008
3. K. Wehrle, F. Pählke, H. Ritter, D. Müller, M. Bechler. Linux® Networking Architecture: Design & Implementation of Network Protocols in the Linux Kernel, 2004.

## 9. SOFTWARE

1. Linux OSes
2. ath5k/b43 drivers, Linux kernel source
3. Dev. Kits trong PTH Internet of Things

**Lecturer**