SYLLABUS

1. **Course name:** Internet of Things: Foundations and Applications
2. **Course code:** ITFA436064
3. **Credits:** 3 credits (3/0/6) (3 theoretical credits, 0 practical credit)
   Duration: 15 weeks (3 main periods and 6 self-study periods) /week)
4. **Instructors:**
   a. Primary instructor: Phan Van Ca, Ph.D
   b. Secondary instructors:
   - Pham Ngoc Son, Ph.D
   - Dang Phuoc Hai Trang, MEng
5. **Course conditions**
   Prerequisites: N/A.
   Corequisites: Embedded Systems.
6. **Course Description :**
7. **Mô tả học phần (Course Description)**

The main aim of this course is to introduce the fundamental concepts of the Internet of Things and its applications and architecture models; the technologies and mechanisms for sensing, actuation, processing and cyber-physical data communication; Discussing semantic technologies, service oriented solutions and networking technologies that enable the integration of IoTs data and services into the cyber world.

8. **Course Goals:**

Goals	***Goal description*** *(This course provides students:)*	ELOs
G1	Ability to apply knowledge about Foundations and Applications including embedded systems, smart devices, communication protocols and data processing techniques.	01 (H)
G2	Ability to design hardware and software for simple IoT applications	02(M), 07 (M)
G3	Ability to analyze and evaluate the design, stardards and application for IoTs	03(M), 11 (H)

** Note: H: **H**igh; M: **M**edium; L: **L**ow*

9. **Course Learning Outcomes - CLOs:**

CLOs		***Description*** *(After completing this course, students can:)*	Outcome
G1	G1.1	Understand concepts in IoT technology	01, 07
	G1.2	Describe design principles of IoT systems and IoT applications development	01
	G1.3	discuss standards and technologies such as 6LowPAN, CoAp, ETSI M2M and W3CSSN	01
	G1.4	Apply digital signal processing algorithms; store and represent sensor data at different levels of the architecture	01, 07
G2	G2.1	Control and interface to peripheral modules through serial communication	02

		interface	
	G2.2	Design embedded hardware based IoT	02,03
	G2.3	Program embedded software and mobile applications	02,03
	G2.4	Analyze, process and display collected sensor data	02,03
G3	G3.1	Ability to analyze and evaluate the design, stardards and application for IoTs	11

10. Study materials:

a. Textbooks:

[1] Daniel Minoli, Building the internetof things with IPv6 and MIPv6, Wiley, 2013.

[2] Holler, Tsiatsis, Mulligan, Avesand, Karnouskos, and Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Academic Press, 2014.

b. References:

[3] Contiki, TinyOS, Ns2, Ns3.

11. Student Assessments:

a. Grading points: 10

b. Planning for students assessment is followed:

Type	Contents	Linetime	Assessment techniques	CLOs	Rates (%)
Homework					**20**
BT#1	Contiki Installation	Week 1	Homework	G1.1	5
BT#2	Program and complie Contiki	Week 2	Homework	G1.2	5
BT#3	Develop applications to collect and analyze sensor data	Week 3-4	Homework	G2.1	5
BT#4	Program networking in Contiki	Week 5	Homework	G2.2	5
Project					**30**
DA#1	Develop an fire alarm system	Week 3	Report	G2.1	
DA#2	Develop context aware sensor network	Week 8	Report	G2.1	
Assignment					
	Final Assigment	Week 10	Simulation Presentation	G1, G2	**50**

12. Course details:

Week	Contents	CLOs
1	***Ch. 1.* Introduction to IoTs** *(3/0/6)* **Teaching contents:** *(3)* 1. Introduction 2. IoT basic concepts 3. Platforms and technologies for IoT development 4. IoT services and Apllications **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	G1.1

	Self-study contents: *(6)* + http://iot.ieee.org/newsletter/september-2014/the-internet-of-things-the-story-so-far.html	
2	***Ch. 2.* CPS systems** *(3/0/6)*	
	Teaching contents: *(3)* 1. Embedded systems 2. CPS systems 2. Smart devices **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	G1.2
	Self-study contents: *(6)* + Contiki + SoC, MPSoC	
3	***Chương 3.* Real World Interaction** *(3/0/6)*	
	Teaching contents: *(3)* 1. Sensors and actuators 2. Amplifier, filter and signal processing 2. ADC, DAC converters **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	G1.2
	Self-study contents: *(6)* + Industrial sensors + AC, DC, Servo motors, and displays	
4	***Ch. 4.* Network layer architecture** *(3/0/6)*	
	Teaching contents: *(3)* 1. PHY 2. MAC 3. IP and Routing 4. TCP/UDP **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	
	Các nội dung tự học: *(6)* + OSI, TCP/IP + Ipv4, Ipv6	
5	***Chương 5.* IoTs Architecture** *(3/0/6)*	
	Teaching contents: *(3)* 1. Topo, 2. EdgeRouter 3. Client-server 4. P2P, M2M **Teaching methods**:	G1.2

	+ Theoretical lectures + Presentation, questions and discussion	
	Self-study contents: *(6)* + C progamming on Contiki + M2M to IoT - An Architectural Overview	
6	***Ch. 6.*** **IoTs Networks** *(3/0/6)*	
	Teaching contents: *(3)* 1. Introduction to Neworks 2. IPv6 3. 6LowPAN **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	G2.2
	Self-study contents: *(6)* + WSN protocols	
7	***Ch. 6.*** **IoTs networks (con't)** *(3/0/6)*	
	Teaching contents: *(3)* 4. Network performances 5. Network programming on Contiki **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	
	Self-study contents: *(6)* + Ipv6	
8	***Ch. 7.*** **Services and application platform** *(3/0/6)*	
	Teaching contents: *(3)* 1. Services 2. Application platforms **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	G2.1
	Self-study contents: *(6)* + CoAP: An Application Protocol for Billions of Tiny Internet Nodes	
9	***Ch. 8.*** **Smart data processing** *(3/0/6)*	
	Teaching contents: *(3)* 1. Sensor data collection 2. Data processing algorithms **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	G1.2
	Self-study contents: *(6)* + WSN progamming	
10	***Chương 9.*** **Semantic technology and web of things** *(3/0/6)*	

	Teaching contents: *(3)* 1. Semantic technology 2. Web of things **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	G2.2
	Self-study contents: *(6)* + *Semantics for the Internet of Things: early progress and back to the future*	
11	***Ch.10.*** **Security, reliability, privacy and compliance in IoT** *(3/0/6)*	
	Teaching contents: *(3)* 1. Reliability 2. Privacy 3. Security **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	G2.1
	Self-study contents: *(6)* + Smart Cities	
12	***Ch. 11.*** **Smart devices** *(3/0/6)*	
	Teaching contents: *(3)* 1. Android 2. Embedded sensor 3. Gateway IoT **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	
	Self-study contents: *(6)* + Smart Healthcare Systems	
13	***Ch. 12.*** **Aplications, Standards and CPS** *(3/0/6)*	
	Teaching contents: *(3)* 1. Smart city 2. Smart agiculture 3. Smart wearable devices 4. Smart grid **Teaching methods**: + Theoretical lectures + Presentation, questions and discussion	G2.1
	Self-study contents: *(6)* + Multi-threading programming	
14	***Ch. 12.*** **Aplications, Standards and CPS (con't)** *(3/0/6)*	
	5. Standards 6. CPS **Teaching methods**: + Theoretical lectures	

	+ Presentation, questions and discussion	
	Self-study contents: *(6)* + Tìm hiểu các ứng dụng khác của IoTs	
15	**Presentation**	

13. Learning ethics:

- Home assignments and projects must be done by the students themselves. Plagiarism found in the assessments will get zero point

14. First approved date: January 15 2012

15. Approval level:

Dean	Department	Instructor
Nguyen Minh Tam, Ph.D	**Nguyen Ngo Lam, MEng**	**Phan Van Ca, Ph.D**

16. Syllabus updated process

1st time: Updated content dated	Instructors
2st time: Updated content dated	Head of department