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VNUHCM-UNIVERSITY OF SCIENCE
FACULTY OF INFORMATION TECHNOLOGY

COURSE SYLLABUS

PHY00007 – Physics for Information Technology

1. GENERAL INFORMATION

Course name:	Physics for Information Technology
Course name (in Vietnamese):	Vật lý cho Công nghệ Thông tin
Course ID:	PHY00007
Knowledge block:	
Number of credits:	4
Credit hours for theory:	45
Credit hours for practice:	30
Credit hours for self-study:	90
Prerequisite:	
Prior-course:	
Instructors:	Cao Xuân Nam Lê Quốc Hòa

2. COURSE DESCRIPTION

The Internet of Things (IoT) is a special network of objects or sensors that allow them to connect to each other to collect and exchange data to bring quality of life for people and society.

In this course, we will learn more about the concept of IoT, common electronic circuit boards, research IoT products, build a basic IoT system to control electronic devices.

In addition, with the growing trend of Big Data and Artificial Intelligence, it is essential to understand and apply artificial intelligence knowledge to IoT products.

3. COURSE GOALS

At the end of the course, students are able to

ID	Description	Program LOs
G1	Understand the technical specifications, operating principles of electrical circuits, sensors, electronic components.	ELO 1.1.2, ELO 1.1.3, ELO 2.4.3, ELO 2.4.5
G2	Fluent in using and programming some popular electronic circuits such as Arduino, ESP 8266, Raspberry Pi 3.	ELO 1.2.1, ELO 1.3.7
G3	Know how to design 3D models and use 3D printers.	ELO 1.3.7, ELO 2.1.4
G4	Know how to build a basic Internet of Things (IoT) system, using web / mobile to control electrical devices in the house, at school or at work.	ELO 1.3.4, ELO 1.3.6, ELO 2.6.4, ELO 4.1.1, ELO 5.1.1, ELO 5.1.2, ELO 5.1.3, ELO 5.3.1, ELO 5.3.2, ELO 5.3.3
G5	Understand the application of Artificial Intelligence knowledge (Natural language processing, Speech language processing, Digital image processing) processing on Raspberry Pi 3 board.	ELO 1.3.2, ELO 1.4.4
G6	Organize teamwork, tasks assignment and report presentation.	ELO 2.1.4, ELO 2.1.5, ELO 2.1.9, ELO 2.2.2, ELO 2.3.2, ELO 2.3.3, ELO 3.3.4,

4. COURSE OUTCOMES

CO	Description	I/T/U
G1.1	Apply the basic scientific knowledge to explain the structure and operations of some basic sensors.	I

G1.2	Understand and use the basic sensors on popular electronic circuits such as Arduino, ESP8266, Raspberry Pi 3.	I,T,U
G1.3	Understand the terminology correctly. Explain and interpret the terminology of this course. Pronoun terms and use them correctly in context.	I
G2.1	Apply the specialized knowledge and skills to the subjects of this course.	I,T,U
G2.2	Apply the practical problems in social to install the illustrative applications.	I,T,U
G3.1	Understand the principles of 3D model design and expert in use of 3D printers.	I,T,U
G4.1	Install the basic Internet of Things system.	T,U
G4.2	Thinking and solving problems. Students can propose new models and solutions (on the basic of combining and changing the learned models and solutions) to suit the practical requirements.	I,T,U
G5.1	Apply the Artificial Intelligence (AI) knowledge to build Internet of Things systems.	I,T,U
G6.1	Writing and speaking skills, presentation skills related to the subjects of this course.	U
G6.2	Seminar in class, teamwork and team presentation.	U

5. TEACHING PLAN

THEORY

ID	Topic	Course outcomes	Teaching/Learning Activities (samples)	Assessments

1	- Introduction to course content - Arduino board and embedded programming principles - Structure, operating principles, and how to program basic electronic devices such as LED, Button, Resistor, PotentioMeter, Buzzer. - Application: Traffic Light	G1.1 G1.2 G1.3	Lecturing Demonstration Q&A	
2	- Operating principles, and how to control basic sensors such as Ultrasonic sensor, Light sensor, PIR sensor. - Application: Surveillance System	G1.2 G2.1 G2.2	Lecturing Demonstration Q&A Group Discussion	
3	- Operating principles, and how to control basic sensors such as Temperature and Humidity sensor. - Program to display text on LCD screen. - Control other electronic devices: 7-segment display, servo, relay - Application: Smart Plant Pot	G3.1	Lecturing Demonstration Q&A Group Discussion	
4	- Design 3D models with Autodesk Fusion 360. - How to use 3D printers to print 3D models.	G2.2 G3.1 G6.1 G6.2	Case Study Demonstration Q&A	
5	- Assemble and program a complete product with Arduino, sensor and wrapped by 3D model.	G1.2 G1.3 G4.1	Case Study Q&A Group Discussion	

6	- Capstone project proposal presentation.	G4.1 G4.2		Seminar: A11
7	- Introduce Esp8266 / Esp32. - Esp8266 / Esp32 as a web server.	G1.3 G2.1 G2.2 G4.1 G4.2	Lecturing Demonstration	
8	- Mid-term exam - Introduction to IoT Concept and IoT Ecosystem - Introduction to NodeRED IDE - Build a web/mobile application using NodeRED to control electronic devices via local wireless network.	G2.1 G2.2 G4.1 G4.2 G6.1 G6.2	Lecturing Case Study Q&A	Midterm exam: A41
9	- Introduction to MQTT, a data transmission and reception protocol. - Communication between Esp8266/Esp32 and NodeRED web server.	G2.1 G2.2 G5.1	Lecturing Q&A	
10	- Integration of Third-Party Support Services such as IFTTT, OpenWeatherMap, ThingSpeak, Firebase, NTP Server.	G2.1 G2.2 G5.1 G6.1 G6.2	Case study Demonstration Q&A	
11	- Advanced thematic: Artificial Intelligence (AI) in IoT - Final Review		Q&A	Interview: A21

LABORATORY

ID	Topic	Course outcomes	Teaching/Learning Activities (samples)	Assessments
1	Traffic Light - Led - Button	G1.2 G2.1 G2.2	Demonstrate Q&A	LW1
2	Garage - Ultrasonic sensor - Buzzer	G1.2 G2.1 G2.2	Demonstrate Q&A	LW2
3	Security - Passive Infrared sensor - Potentiometer	G1.2 G2.1 G2.2	Demonstrate Q&A	LW3
4	Temperature - Temperature sensor - LCD	G1.2 G2.1 G2.2	Demonstrate Q&A	LW4
5	Design 3D - Clock	G3.1	Demonstrate Q&A	LW5
6	Event logs - NodeRED - NodeRED dashboard	G1.2 G1.3 G4.1 G4.2	Demonstrate Q&A	LW6
7	Weather station - OpenWeatherMap service - Gauge	G1.2 G1.3 G4.1 G4.2	Demonstrate Q&A	LW7

8	Data Visualization - Cloud ThingSpeak - Chart	G1.2 G1.3 G4.1 G4.2	Demonstrate Q&A	LW8
9	Push Notification - IFTTT service - MQTT	G1.2 G1.3 G4.1 G4.2	Demonstrate Q&A	LW9
10	Summary			

6. ASSESSMENTS

ID	Topic	Description	Course outcomes	Ratio (%)
A1	**Seminars**			**15%**
A11	Capstone project's prototype	Presentation in class Q&A Submit the document		15%
A2	**Projects**			**40%**
A21	Capstone project	Interview Demo final product Q&A Submit the document		40%
A3	**Laboratory**			**20%**
A31	Lab Assignments: LW1, LW2, LW3, LW4, LW5, LW6, LW7, LW8, LW9	Submit code and report		20%

A4	**Exam**			**25%**
A41	Mid-term exam	Paper test in class		25%

7. RESOURCES

Textbooks

- Slides of lecture
- "Build a Home Automation System for $100", Rui Santos, 2019.

Others

- Raspberry Pi beginner's guide. Website: https://www.raspberrypi.org/magpi-issues/MagPi49.pdf
- Raspberry Pi Projects Book. Website: https://www.raspberrypi.org/magpi-issues/Projects_Book_v1.pdf

8. GENERAL REGULATIONS & POLICIES

- All students are responsible for reading and following strictly the regulations and policies of the school and university.
- Students who are absent for more than 3 theory sessions are not allowed to take the exams.
- For any kind of cheating and plagiarism, students will be graded 0 for the course. The incident is then submitted to the school and university for further review.
- Students are encouraged to form study groups to discuss on the topics. However, individual work must be done and submitted on your own.