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.	
G2	Fluent in using and programming some popular electronic circuits such as Arduino, ESP 8266, Raspberry Pi 3.	
G3	Know how to design 3D models and use 3D printers.	
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.	
G5	Understand the application of Artificial Intelligence knowledge (Natural language processing, Speech language processing, Digital image processing) processing on Raspberry Pi 3 board.	
G6	Organize teamwork, tasks assignment and report presentation.	

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	- Introduce the course content - Introduce Arduino electronic board - Program on Arduino board to control LED, some basic sensors	G1.1 G1.2 G1.3	Lecturing Demonstration	QZ1: Quiz 1

	such as light sensor, motion sensor, humidity and temperature sensor…			
2	- Program to display text on LCD screen - Assemble and program to control a mini vehicle with Bluetooth and motor.	G1.2 G2.1 G2.2	Lecturing Demonstration, Q&A, Group Discussion	QZ2: Quiz 2
3	- Design 3D models with Autodesk Fusion 360.	G3.1	Lecturing Demonstration, discussion	QZ3: Quiz 3
4	- Assemble and program a complete product with Arduino, sensor and wrapped by 3D model.	G2.2 G3.1 G6.1 G6.2	Case study and discussion	QZ4: Quiz 4
5	- Introduce ESP 8266 and Raspberry Pi 3 boards. - Install and config Raspbian Operating System for Raspberry Pi 3.	G1.2 G1.3 G4.1	Lecturing Demonstration, Q&A, Group Discussion	QZ5: Quiz 5
6	- Introduce Socket concept and data transmission/reception model. - Program communication between ESP8266 and Raspberry Pi 3 via local wireless network.	G4.1 G4.2	Lecturing Q&A	QZ6: Quiz 6
7	- Introduce a basic Internet of Things system model. - Introduce NodeRed IDE	G1.3 G2.1 G2.2 G4.1	Lecturing Demonstration	QZ7: Quiz 7 Seminar: A21

	- Build a web/mobile application to control electronic devices via local wireless network.	G4.2		
8	- Build a web/mobile application to control electronic devices via local wireless network (cont.)	G2.1 G2.2 G4.1 G4.2 G6.1 G6.2	Lecturing Case study and discussion	Midterm exam: A51
9	- Advanced thematic: Artificial Intelligence (AI) in IoT	G2.1 G2.2 G5.1	Lecturing	
10	- Advanced thematic: Artificial Intelligence (AI) in IoT (cont.)	G2.1 G2.2 G5.1 G6.1 G6.2	Case study, discussion	
11	- Review		Q&A, Discussion Project submitted Capstone Project	Seminar: A31

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	G1.2 G1.3	Demonstrate Q&A	LW9

	- MQTT	G4.1 G4.2		
10	Summary			

6. ASSESSMENTS

ID	Topic	Description	Course outcomes	Ratio (%)
A1	**Assignments**			**10%**
A11	Quizzes: QZ1, QZ2, QZ3, QZ4, QZ5, QZ6, QZ7	Small quizzes in class for each topic		10%
A2	**Seminars**			**15%**
A21	Capstone project's prototype	Presentation in class Q&A Submit the document		15%
A3	**Projects**			**30%**
A31	Capstone project	Presentation in class Q&A Submit the document Demo product		30%
A4	**Laboratory**			**25%**
A41	Lab Assignments: LW1, LW2, LW3, LW4, LW5, LW6, LW7, LW8, LW9	Submit code and report		25%
A5	**Exam**			**20%**
A51	Mid-term exam	Paper test in class		20%

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.