

Internet of Things (物聯網) 2019

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Time: Tuesday 14:00~16:50

Place: E6-A205

Web Page: <https://staff.csie.ncu.edu.tw/jrjiang/IoT2019/>

Course Description:

The Internet of Things (IoT) has been connecting billions of things or machines electronically for them to exchange many different types of information with one another. With all the machines in the world connected, lives will be transformed significantly. Many technologies are involved in the concept of IoT and are worthwhile investigating. This course is intended to provide in-depth examinations of IoT technologies so that students can realize how machines are connected and how information is captured and exchanged. The applications of the IoT concept are also covered in the course.

Furthermore, in view of the evolution (revolution) of Industry 4.0 (I4.0), we also introduce the concept of Industrial Internet of Things (IIoT) and its related technologies, such as the Cyber-Physical System (CPS) and Deep Learning (DL).

Goal:

Students can make their own IoT applications, either web-based or APP-based.

Scoring :

- Midterm Report: 35% (Every student should upload one set of slides and one 10- to 15-min video presentation related to a designated IoT topic.)
- Final Project: 55% (Every student should conduct a final project to implement a web-based or APP-based IoT application to display the information of at least one smart thing on the web or APP, and even to automatically control things in an AI manner.)
- In-Class: 10%

Reference Books:

- Adrian McEwen and Hakim Cassimally, Designing the Internet of Things, Wiley, 2014.
- 超圖解物聯網 IoT 實作入門：使用 JavaScript/Node.JS/Arduino/Raspberry Pi/ESP8266/Espruino, ISBN：9789863123439, 趙英傑, 旗標, 2016.
- 打造 Web 物聯網：使用 Node.js 與 Raspberry Pi, ISBN：9789864764693, Dominique Guinard Vlad Trifa (吳致佑, 李健榮), 碁峰, 2017.
- Node.js 物聯網裝置開發, ISBN:9789864764594, Kelsey Breseman and Patrick Mulder, 歐萊禮, 2017.
- AIoT 人工智慧在物聯網的應用與商機, ISBN：9789864768066, 裴有恆, 陳玟錡, 碁峰, 2018.
- Android App 程式設計教本之無痛起步：使用 Android Studio 2.X 開發環境, ISBN：9789863123989, 施威銘/主編, 旗標, 2017.
- Android 程式設計入門、應用到精通：修訂第四版(使用 Android Studio 3.X, 適用 Android 8.X/7.X 和 Android Wear), ISBN：9789864767274, 孫宏明, 碁峰, 2018.

Syllabus:

- **(9/17)(9/24)** Introduction to (Internet of Things), IIoT(Industrial Internet of Things), Cyber-Physical System (CPS), and Industry 4.0 (I4.0) ([IIoT-I4.0.zip](#)) ([DeepLearningforCPS\(HiroshimaU\).zip](#)) ([ML.pptx](#))([DeepLearning.pptx](#))
- **(10/1)** Localization ([GPS.zip](#)) ([Localization.zip](#)) ([智慧工廠工件生產履歷與定位追蹤管理](#)) ([PINUS](#))([antennas](#))
- **(10/8)** Introduction to Internet: ISO OSI, TCP/IP, UDP/IP
- **(10/15)** Power Saving MAC (Media Access Control) Protocols for MANETs ([MAC.ppt](#)) ([QPS-NCU.ppt](#))([HPS4.ppt](#))
- **(10/15)** Introduction to RFID and NFC ([RFID-NFC.zip](#))
- **(10/22)** Introduction to MANET routing protocols ([ManetRouting.zip](#))
- **(10/22)** Wireless Rechargeable Sensor Networks (WRSNs) ([EH&WRSN.pptx](#))
- **(10/29)** **PLC, SCADA, and Fieldbuses** ([PLC-SCADA-Fieldbus.zip](#)) ([EtherCAT.zip](#)) ([OPC-UA.zip](#))
- **(11/5)** Midterm (No Class)(For preparing midterm oral reports)
- **(11/12)** APP programming ([IoTApp.zip](#))([ExampleCode.zip](#)) ([PBL: SMAR video](#))([Smart Glasses AR demo](#))
- **(11/19)** Introduction to Deep-learning programming on phones ([DLonPhones.zip](#))
- **12/17** Hand in 1- to 3-page proposal of your final project. The proposal should include the title, overview, devices used, technology used, intended input and output, system architecture, and application scenarios. It is suggested to put more pictures/diagrams.
- **(11/26)(12/3)(12/10)(12/17)(12/24)**

Topics for oral reports:

(A student should report a topic. Six topics are reported in a week, and each topic has 25 minutes for presentation, including Q&A. TA will assign the topics.)

(You should upload the slides and Q&A details to the LMS system)

1. Bluetooth; 2. Zigbee (802.15.4); 3. CoAP; 4. MQTT; 5. 6LowPAN; 6. RESTful interface; 7. WebSocket; 8. LoRa; 9. NB-IoT; 10. Sigfox; 11. Arduino; 12. Raspberry Pi; 13. SSL/TLS; 14. LDAP/X.509; 15. IoTtalk; 16. ThingWorx; 17. oneM2M; 18. IoTivity/AllJoyn; 19. Node.js; 20. Vue.js; 21. Django; 22. MySQL; 23. MongoDB; 24. Elasticsearch

- **(12/31)** Final project oral report (Everyone should report his/her project for 6 min. with slides, which should be uploaded by 1pm on 1/8. The report should include (1) the subject(title), (2) motivation, (3) goal, (4) background, and (5) current progress.)
- **(1/6-1/15)** Final Project Demo: Make an appointment with TAs to demo your project.

Welcome to join our class!