School of Informatics Teaching Course Proposal Form

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Proposal

Course Name: The Internet of Things
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Course Year: 4
Names of any courses that this new course replaces :
Embedded Systems

Course Outline

Course Level: 11
Course Points: 20
Subject area: Informatics
Programme Collections:
Computer Science, Software Engineering.

Teaching / Assessment

Number of Lectures: 20
Number of Tutorials or Lab Sessions: 11
Identified Pre-requisite Courses: Operating Systems
Identified Co-requisite Courses: Computer Communications and Networks
Identified Prohibited Combinations: NA

Assessment Weightings:
Written Examination: 30%
Assessed Coursework: 55%
Oral Presentations: 15%

Description of Nature of Assessment:

The course will involve a major coursework that will require students to work in pairs to design, build, and evaluate a practical IoT system. Students will be required to demonstrate their prototypes and present orally their projects at the end of the course, and document their designs and results in a workshop style research paper. By requiring students to work in pairs, the course would minimise the hardware resources required, while allowing examiners to distinguish between individual student's contributions.

The course workload is aligned with the school recently agreed workload profile of 200 hours for a 20 credit course. Specifically the hours will be allocated as follows: - 10weeks x 2h lectures - 11weeks x 4h lab sessions - 12weeks x 6h individual work - 1 day oral presentation preparation - 4 days exam preparation - 1/2 day sitting exam and oral presentation - 20 hours programme level activities (ILW, office hours, PT meetings)

One piece of formative assessment will consist of students submitting a short proposal document, outlining the planned IoT prototype.

The second piece of assessment is summative and requires marking the workshop style papers that document the projects.

Teaching support involves demonstrator(s) according to student numbers, one marker at 1 hour per student, 40h TA for course preparation.

Course Details

Brief Course Description:

IoT is a rapidly evolving field underpinned by the large scale development of a plethora of networked cyber-physical systems equipped with multi-modal sensing capabilities and heterogeneous communication technology. Interconnecting such large number of devices and intelligently processing the data they generate, requires understanding of embedded systems, networking protocols, algorithms, security, programming, data analytics and visualisation.

Students taking The Internet of Things course will be introduced to the fundamentals of the IoT paradigm, including hardware platforms, communication protocols, and the types of services that can be enabled over this ecosystem. The attendees will build solid grounding in key IoT technologies and different methodologies for addressing domain specific challenges. The course will also have an important practical component, allowing students to design example IoT systems and develop simple software applications running on top of these.

ARM will provide mbed IoT prototyping boards for student training purposes, which would add value to the students profiles in view of employment in technology and data-oriented companies, as well as for eventual doctoral studies.

This course will complement the Computer Systems, Networking, and Data Science research efforts in the University, and will be relevant to students in the PPar and Data Science CDTs. It will also complement our offering in several other areas, including operating systems, security, and robotics.

Detailed list of Learning Objectives:

1: Acquire good understanding of the Internet of Things concept and systems architecture; 2: Operate with wireless technologies and networking protocols specific to IoT systems; 3: Become familiar with standard security and privacy preserving mechanisms; 4: Design, implement, and test a simple IoT system equipped with sensors and wireless transceivers; 5: Understand different cloud integration methods; 6: Present clearly and concisely the design and performance of an IoT system; 7: Write technical documentation of a research project and results obtained by means of experiments in a workshop style paper format.

Syllabus Information:

A tentative list of topics is given below (these are not in 1-1 correspondence to lectures): 1. Introduction to IoT, industry drivers, applications domain; 2. IoT architecture; 3. Hardware platforms, low power devices, sensors; 4. Wireless technologies (Wi-Fi, Bluetooth, BLE, Zigbee, Z-Wave); 5. Networking protocols (M2M, LoRa, IPv6, 6LowPAN); 6. Security and privacy; 7. IoT device programming and debugging; 8. Cloud integration; 9. Data analytics and visualisation; 10. Commercialisation challenges.

Recommended Reading List:

TBD

Any additional case for support information:

The proposed course is intended to replace the current Embedded Systems module and will be delivered together with Bjoern Franke (the current organiser of Embedded Systems).

The course will have a strong practical component with 4-hour lab sessions during which students can experiment with mbed IoT boards provided by ARM.