Faculty of Health, Science and Technology
Computer Science

Syllabus

Internet of Things

Course Code:	DVAD70
Course Title:	Internet of Things
	Sakernas internet
Credits:	7.5
Degree Level:	Master's level
Progressive Specialisation:	Second cycle, has only first-cycle course/s as entry requirements (A1N)

Major Field of Study:
DVA (Computer Science)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2020-09-15, and is valid from the Spring semester 2021 at Karlstad University.

Prerequisites
Upper secondary level English 6 or B and 30 ECTS credits completed in Computer Science (including Computer Networking 7.5 ECTS credits), or three years of work experience in the IT sector, or equivalent

Learning Outcomes
Upon completion of the course, students should be able to:
1. explain and discuss the Internet of Things as a concept and its typical areas of use,
2. describe the characteristics of different technology alternatives, and based on those characteristics, suitable areas of use,
3. use tools to analyse a data set from sensors,
4. explain how privacy and security can be achieved in the Internet of Things,
5. identify factors that influence energy consumption and discuss how a low level of energy consumption can be achieved, and

6. create a system solution for an IoT application scenario, and justify choices of architecture, components, and other aspects treated in the course.

Content
The course covers the Internet of Things, where communication occurs between connected free-standing devices, rather than between humans and machines. The focus of the course is small, resource-saving devices such as sensors for measuring, steering of regulators, and communication between them.

The course begins with an introduction to the field and presents current areas of application. The Internet of Things comprises many different technologies, and the course covers a number of building blocks such as architectures, radio interfaces, and communication protocols. When several devices are connected, a large amount of data is produced and must be handled, and the flow of data is treated from collection to the steering of another device based on collected and analysed data.

An important aspect of connected systems is integrity and security. It is a challenge, especially for resource-constrained devices, to keep software updated and prevent unauthorised use or wiretapping.

For sensors, energy consumption is a significant factor, both in relation to long battery life and in relation to environmental concerns. The course therefore treats the influence of communication interfaces and communication protocols on energy consumption.

The course comprises five modules as follows:
1. Areas of application: Health, smart homes, smart cities, industry 4.0
2. Infrastructures. Online sensors, gateway connections, mesh networks. Technologies such as NB-IoT, ZigBee, 433MHz, Z-Wave, LoRa, WiFi, Bluetooth, CoAP, MQTT
3. Data management (collection, storage, processing, analysis, automation, presentation)
4. Privacy and security (surveillance, behavioural patterns, encryption, firmware updates, attack vectors)
5. Energy optimisation (10 years of battery life - how can we achieve this? What can influence energy consumption?)

The course includes practical/laboratory components. Students purchase and pay for the equipment they need.

Reading List
See separate document.

Examination
Assessment is based on individual hand-in assignments and an oral exam.

If students have a decision from Karlstad University entitling them to special pedagogical support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades
One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course. Engineering students are awarded one of the grades Pass with Distinction (5), Pass with Some Distinction (4), Pass (3) or Fail (U).

Quality Assurance
Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate
A course certificate will be provided upon request.

Additional information
The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.