

7 Mobile and Sensor Systems (CM)

Duke of Cambridge College has invested in a number of sensors for a pilot study to monitor the use of its spaces (both outdoor and indoor), its energy efficiency and the comfort of its students. In particular, the college has invested in temperature sensors, light sensors and movement sensors, all equipped with WiFi and Zigbee radio chips (assume the college has a WiFi network in place already). The college council has, however, prohibited the installation of permanent wires for powering the sensors in the interest of period building preservation.

- (a) Describe the architecture for the wireless sensor network system you would put in place on behalf of the college, illustrating the physical components and the communication infrastructure. [3 marks]
- (b) Select a wireless sensor network MAC protocol for this network and explain why you have chosen it. [3 marks]
- (c) Describe the *Directed Diffusion* protocol and illustrate how the protocol can be applied in the wireless sensor network of Duke of Cambridge College. [5 marks]
- (d) Now assume that due to connectivity limitations and the extension of the college grounds, a group of nodes of the wireless sensor network cannot be connected to the rest of the network, nor the college Internet. The data generated by these nodes, however, is vital but not time critical. Explain how you would handle the data harvesting for this portion of the network through the use of a delay tolerant networking approach. [4 marks]
- (e) After the first roll-out of the pilot study, a bright student suggests that a mobile phone application could be released to allow willing students who want to install it on their smartphones to contribute data about their use of college space. Explain what salient features the application would need to have and how it would be able to detect the student's use of space (mainly location and activity) and transmit the data back to the college system. [5 marks]