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| Module name and code | **Internet of Things 6COSC014C** |
| CW weighting | 100% |
| Lecturer setting the task with contact details and office hours | Shirin Primkulova sprimkulova@wiut.uz |
| Submission deadline | 1/12/2023 |
| Results date and type of feedback | 22/12/2023 (Written) |
| **The CW checks the following learning outcomes:** | |
| 1. Explain the use and value of IoT in different industries. 2. Recognise components of an IoT system and their connections and incorporate them into a circuit. 3. Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators. 4. Develop the necessary control software for IoT system. | |

**Deadline for report and code is the 1st of December 2023.**

**Viva for project demonstration will be scheduled on 6th of December 2023.**

**Task**

This is an individual task. You are required to build Internet of Things system prototype which should serve to solve people’s needs or environmental/business problems. For this, you can use microcontroller unit Arduino Uno, ESP8266 and/or microprocessor unit RaspberryPi. **Note**: you are not restricted to use only this equipment, you can use any other devices/kits/things. There should be web or mobile application which will allow to monitor and control the work of the system remotely. Along with built application, you are required to prepare report (see description below) – expected word count is 2000 words.

Submission of portfolio will be accompanied with Viva Voce where you will have to demonstrate the work of application and created IoT system. **Attending Viva Voce is mandatory**.

**Entries:**

* Report:
  + Introduction to case
  + Proposed solution
  + Things used (devices, sensors, and actuators)
  + Technology used and obtained results
  + Reflection on results and future work
* Graphical system’s (circuit’s) snapshot (done on Tinkercad, Fritzing, etc)
* Logical network snapshot and simulation file done in any relevant software (Cisco Packet Tracer, GNS3, VIRL, etc.)
* System prototype
  + Arduino code files, RaspberryPi code files
  + Mobile/web application’s project with source code
  + Link to published website or .apk file

**Report**

You are required to create an Internet of Things system prototype. Select the case from the list below.

1. University / Office
2. Plant / Factory
3. Farm/ Agriculture
4. City
5. Hospital

Your report should follow the structure:

**Table of contents.**

**Case**: general description of organization with list of activities, its size, needs and identified problems.

**Proposed solution**: analyse identified problems and propose rationalised solution. How exactly your solution will help? How effective the implementation will be? What part of life will get improvement? What resources will be economised by proposed solution? You are bound to budget but try to be creative and resourceful. Propose perfect solution, so as if you had resources. Later you can downsize it or find compromise.

**Things used**: section should describe, and reason all used devices, sensors, actuators, communicators, etc. This section should be supported by corresponding circuit and network graphs. You should reason which mean and medium of communication was chosen and why. Provide calculations on power/current/voltage for created circuits.

**Technology used**: discuss possible vs. selected technologies to be used for project implementation. Reason the technology which was selected for remote monitor and control (language, platform, etc). Demonstrate obtained results.

**Reflection on results and future work**: discuss limitations of the system. To which extend prototype reaches stated goal? what can/should be done in future to improve the system?

Bibliography.

**Prototype**

**Important note**: *not all features stated in the related sections of report should necessarily be implemented* (due to limits in resources). The prototype should include following features:

**Application**: front-end and server-side files. You are required to develop prototype to control and monitor built Internet of Things system. Application should be published in a web; link should be provided. Note: if you create mobile application, also submit all necessary files and build.

You are allowed to use external resources for development of prototype (i.e. JS packages). However, all packages and video tutorials used must be referenced. Fail to reference external sources may be considered as an act of plagiarism and will be penalized.

**IoT system (prototype):** there should be at least 3 sensors and 3 actuators connected (number of sensors can compensate actuators and vice versa). At least one device to transmit data into network.

**Format**

1. Archive with prototype (including code files, .pkt, .apk, etc.)
2. Report through Turnitin.
3. Word-processed Arial 12, double-spaced
4. Include a contents page giving the headings and page numbers of each section.
5. Pages should be numbered
6. Use the University of Westminster method of referencing
7. Do not include loose pages
8. Your name should not be indicated anywhere

**Submission requirements**

Coursework must be submitted to University Intranet (Learning board). Report and archive with Project must be submitted separately in relevant section indicated in intranet.

After final submission of portfolio (report and application files), you are required to attend Viva Voce to demonstrate work of developed system. You should come with assembled circuits and networks; no extra time will be given for assembling. Time and venue of Viva Voce will be communicated by module leader.

**Important note**: Failure to attend VIVA will result in **0 mark** for the **Prototype** **assessment component**.

**Naming conventions**

Files and folders should be well organized and have meaningful names.

Save the entries as follows: **Modulename.EntryType.IDnumber**

Example: **IoT.Report.00001111**

**Marking Scheme and Assessment Criteria**

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| **Component** | **Mark %** |
| *Report* | **30** |
| * Introduction to case | **3** |
| * Proposed solution | **5** |
| * Things used (devices, sensors and actuators) | **10** |
| * + Circuit prototype with link and working code | **5** |
| * Technology used and obtained results | **10** |
| * + Network prototype | **5** |
| * Reflection on results and future work | **2** |
| *Prototype* | **70** |
| * Developed Mobile or Web application of cloud level | **20** |
| * + Developed Mobile or Web application of edge level only | **10** |
| Control of things via network Clear logic and smooth work for controlling actuators (**5 marks for each**) | **15** |
| Monitor of things in real time Actual serial data is displayed (**5 marks for each sensor**) | **15** |
| Data is represented in form of chart/graph (5 marks) | **5** |
| Extra features: text to speech, speech to text, image/video recognition, etc. | **10** |
| Publishing project/ working .apk | **5** |

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| **Criteria**  **Mark (%)** | **Report (30%)** | **Prototype (70%)** |
| **90 – 100** | Professional and innovative approach in identification and discussion of problems. Excellent analysis and strong justification of proposed solution and used things and technology.  Document is proofread, well-structured and broad and consistent list of resources used.  Autodesk Tinkercad circuit is provided. Packet tracer solution for network is provided. | Professional implementation of all features indicated in proposed solution. All functionality is fully implemented and works according to requirements. Code is clear, understandable, and fully commented. Projects is published in Web. All 6 sensors/actuators connected. There is working cloud level application which allows to control and monitor the system remotely. Extra features (chart, voice, etc) implemented. |
| **80 – 89** | Very good and innovative approach in identification and discussion of problems. Very detailed analysis and strong justification of proposed solution and used things and technology.  Document is proofread,  well-structured and broad and consistent list of resources used.  Autodesk Tinkercad circuit is provided. Packet tracer solution for network is provided. | Excellent implementation of all features indicated in proposed solution. Most functionality is fully implemented and works according to requirements. Code is clear, understandable; most of code is commented. Projects is published in Web. All 6 sensors/actuators connected. There is working cloud level application which allows to control and monitor the system remotely. Extra features (chart, voice, etc) implemented. |
| **70 – 79** | Very good and innovative approach in identification and discussion of problems. Detailed analysis and justification of proposed solution and used things and technology.  Document is proofread, well-structured and broad and consistent list of resources used.  Autodesk Tinkercad circuit is provided. Packet tracer solution for network is provided. Minor adjustments can be added. | Very good implementation of all features indicated in marking scheme. Most functionality is fully implemented and works according to requirements. Code is clear, understandable; most of code is commented. Project is published in Web. All 6 sensors/actuators connected. There is a working cloud level application which allows to control and monitor the system remotely. |
| **60 – 69** | Very good indication of problems and structured analysis and justification of proposed solution and used things and technology.  Document is proofread, well-structured and consistent list of resources used.  Autodesk Tinkercad circuit is provided. Packet tracer solution for network is provided. Minor adjustments can be added. | Most of features required are implemented and works according to requirements. Clear code and application architecture, meaningful comments are present. Project is published in Web. Most of the necessary sensors/actuators connected. There is working application which allows to control and monitor the system remotely. |
| **50 – 59** | Adequate analysis and justification of proposed solution and used things and technology.  Document is proofread, well structured | Most of features required are implemented and works according to requirements. Clear code: application architecture could be improved; meaningful comments are present. Most of the necessary sensors/actuators connected. There is working application which allows to control and monitor the system. |
| **40 – 49** | General description of case with limited details. Some discussion on possible solutions is given. Things used are outlined. Document is well-structured. | Features required are generally implemented. Not all features implemented according to requirements. Code is overall clear, architectural decisions made must be improved. Most of the necessary sensors/actuators connected. There is working application which allows to control and monitor the system. |
| **30 – 39** | All sections are rather brief. Analysis and justification must be enhanced. | Features required partially implemented and/or works not according to requirements. Code is not clear, almost no comments present. Few sensors/actuators connected. There is working application which allows to control and monitor the system. |
| **20 – 29** | Some description all sections. Limited details of chosen things and technology. Justification on proposed solution is missing or very weak. | Only few features implemented. Overall application does not fit requirements of solution. Only few sensors/actuators connected. |
| **10 – 19** | Poor description of chosen case and revealed problems. Some sections are missing. Technology proposed is not appropriate | Implementation is extremely limited. |
| **0 – 9** | Some attempt or missing report | Some attempt to implement features required. Failure on Viva |