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Introduction
In the KTD 6 part of the HTSM Master students conduct a project where groups of 2 students collaborate to design, realize and test an application onto an Arduino microcontroller using an Arduino development kit. Each group of students will receive such a kit which has to be returned to the lecturers after finalizing the assignment (how?).

In this manual, the learning objectives are listed, an overview of the activities within the project is provided, and the grading is explained. Furthermore, some references for additional information are given.

Learning objectives
The project has a number of learning objectives concerning the design, implementation and testing of an embedded system.

- Design: The student can develop an embedded system involving both hardware and software
- Implementation: The student can build a system according to a design
- Testing: The student can test whether the system meets its requirements

Activities
Week 1:
- Lecture on Cyberphysical Systems and an introduction to the assignment
- Getting familiar with the Arduino kit and development environment
- Write a project proposal
  The project plan consists of
  o Application
    ▪ Description
    ▪ Specification
  o Design (How to map application onto Hardware and Software)
  o Implementation (How to implement the different parts)
  o Testing
  o Planning and definition of tasks for the individual members

Page limit: 4 pages, 11 point font.
Deadline: Monday week 2, 9:00 hours.
**Week 2:**
- Presentation (20 minutes) + Discussion (10 minutes) by each project group. In the presentation each group will present its project which will be discussed with the lecturers.

**Weeks 3 and 4:**
- Execution of the project proposal and recording of the final system on a video. This video should be submitted to the lecturers.

The video consists of:
- Explanation of the application
- Explanation of the major design decisions
- Recordings of the execution of tests
- Final demonstration

Time limit: 5 minutes

Deadline: Friday Week 4, 23:59 hours.

**Grading**
The final grade for the project is determined using the weights in the following table:

<table>
<thead>
<tr>
<th>Part</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project plan</td>
<td>30 %</td>
</tr>
<tr>
<td>Video</td>
<td>70 %</td>
</tr>
</tbody>
</table>

**Grading criteria**
Project plan:
- Structure of the plan: are the separate phases (Design, Implementation, Testing) distinguished correctly
- Quality of the description of the phases
- Feasibility of the plan (planning)
- Completeness

Video:
- Complexity of the demonstrated system
- Correctness of the system by executing tests
- Explanation of design choices
References
More information on the Arduino can be found on: www.arduino.cc. Especially under the tab “Learning” students can find material to get started and examples. If more information is needed, this can be found on: http://www.home.ewi.utwente.nl/~kokkel/HTSM%20Master/.