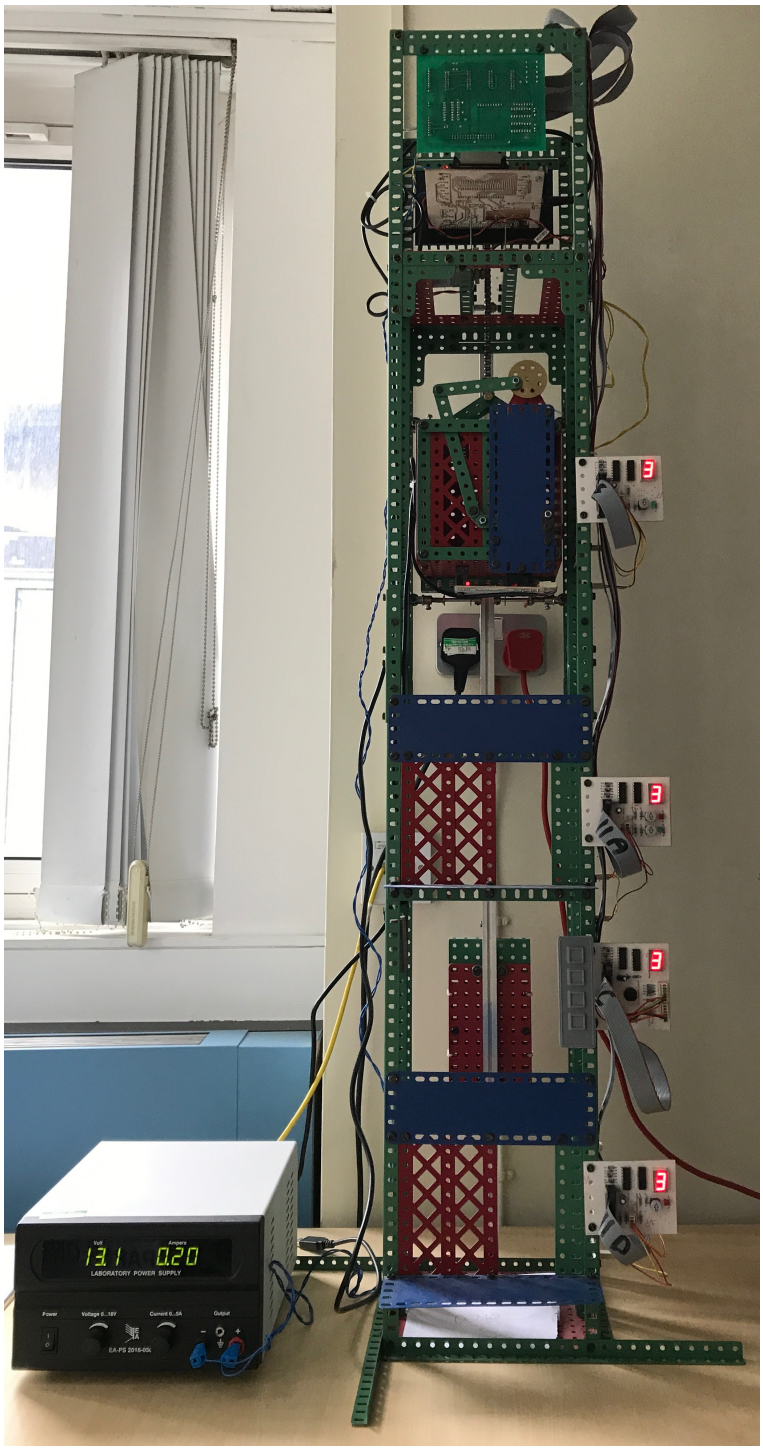
Mechatronics –

Design, Build and Test exercise

lift (elevator) which has stops at three floors



The course purposes

The design, build and test part of the Engineering Skills 1 course requires students to work in project teams to create their own design solution to an engineering problem. A project brief and product design specification will be given along with an outline of the basic engineering principles that will have to be employed to solve the problem.
Throughout this course students are expected to gain an understanding of:

- Working in teams
- Using a design and specification process
- Project Management.
- Mechanical and Electrical construction.
- Programming and software engineering.
- Problem solving, creativity and critically assessing designs.

Course structure

Throughout this course students will work in groups of 4/5, minimum group size will be 3. Groups will be assigned by the lecturing staff.
The course will consist of independent group work and weakly student groups will be expected to report to lecturing staff about problem, progresses and showing the individual lab book.

The Design Brief

Design and build lift (elevator) which has stops at three floors. The operation of the lift should be as close as possible to the real thing, with buttons and indicators at each floor to show where the lift car is, and buttons inside the lift to enable you to select the floor to which you wish to travel.
The project will be built using a metal construction set ("Metallus") and consist in programming a microcontroller connected to printed circuit boards (PCBs) with a variety of switches and indicators fitted.

Product Design Specification

The design brief has been expanded into a basic set of product design specifications, these are requirements that your design must meet. The design:

- Must use metal construction set (metallus kit), microcontroller, pre-made PCB bords and motors to design and build a lift (elevator) which has stops at three floors and work as close as possible to a real one.

Basic design concept and key component information

It is expected that your design will be based around the following components:

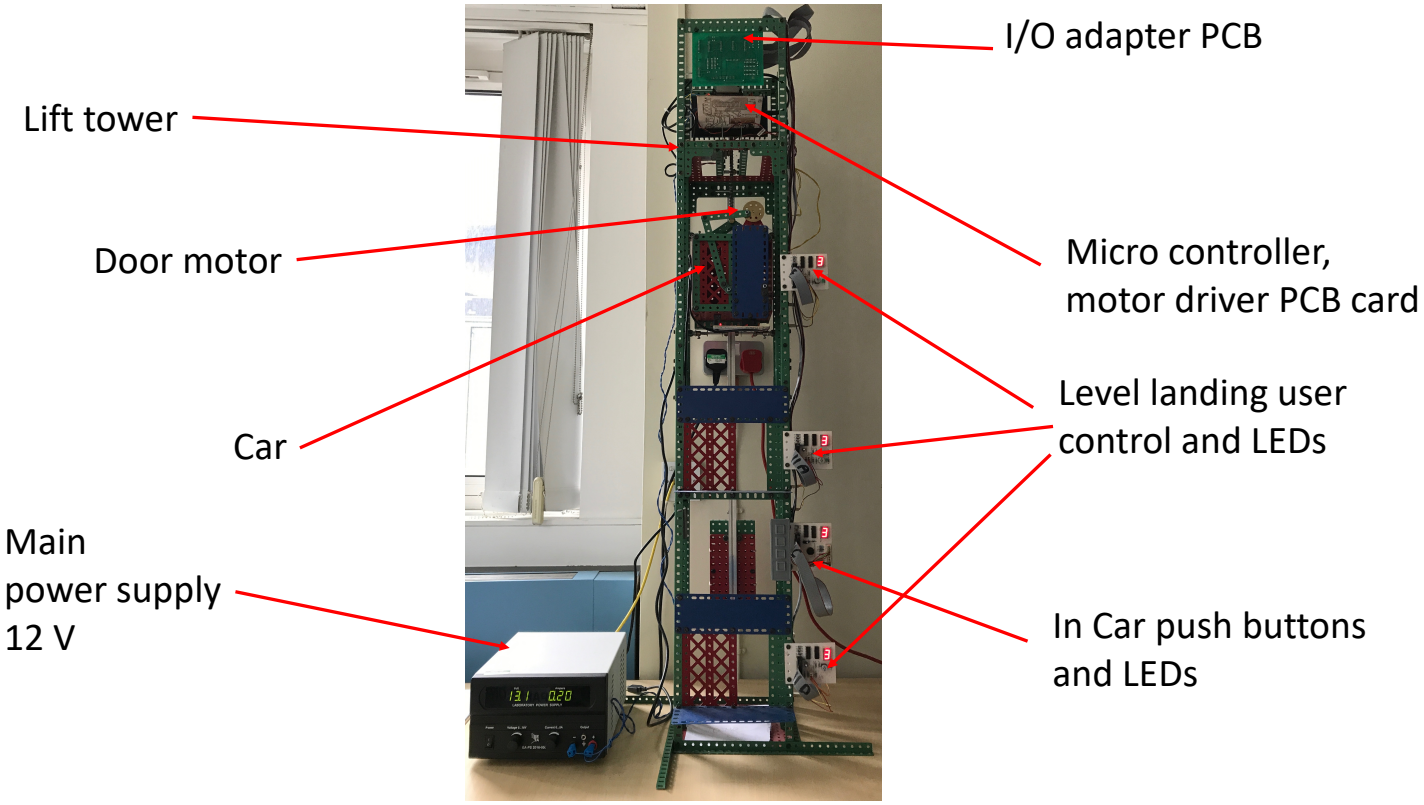
- a tower with three stops
- a car with doors that open and closes

- a method of control the car to stop at three different flors as a real elevator

Resources Available

- Metal construction set (“Metallus”; like Meccano)
- Limit switches and manual control;
- Microprocessor, power supplies and ‘H’ bridges. (1 of)
- Cable connection card. (1 of)
- Lift car push buttons and display. (1 of)
- Lift tower limit switches. (2 of)
- Lift car door optical limit switches. (1 of)
- Landing switches & display boards. (3 of)
- Lift car position sensors. (7 of)
- Lift tower manual motor drive & buzzer. (1 of)

See course notes available on moodle for more details about components.



This year for the first time you will be given the choice for the microcontroller:

- PICAXE (previous year choice with a lot of testing and material on moodle)

- ARDUINO (introduced two years ago with less material on moodle but more useful and familiar language)

Course assessment and deliverables

Verbal communication – 10% of your overall engineering skills grade

Verbal communication skills are essential to engineers. At the end of the course (last lab) a design review of your design will be carried out. At this point all members of the group will be expected to take part in the discussion of the design, its flaws and potential remedies. Each member of the group will be assessed for the ability to communicate in a design review, this will form part of the overall course mark.

Physical model – 10% of your overall engineering skills grade

A working model of the lift

Project written output – 30% of your overall engineering skills grade

This consists of a lab book where there is your written record of practical work. For more details see course contents and practice document.

Individual project review and peer review justification – 10% of your overall engineering skills grade

One page type written document discussing your review of the project. In addition to the one page review you must also include a justification of the peer review marks that you gave to your colleagues