EEU22E10 ENGINEERING DESIGN IV: PROJECT [10 credits]

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Module organisation
This module runs throughout the second semester consisting of lectures together with two two-hour laboratories each week (total contact time of approximately 55 hours).

Module description, aims and contribution to programme
The 2E10 Engineering Design IV module introduces the challenge of electronic systems design. The project is an example of 'hardware and software co-design' and the scale of the task is such that it requires teamwork and a co-ordinated effort. Each group has access to the basic shell of a vehicle that includes the motor assemblies, battery holders and sensors. The completed system should comprise of a computer controlled autonomous vehicle with motor driven wheels and position sensors. The motors and the position sensors should operate under control from a programmable microcontroller and the vehicle should communicate with a base station using a wireless standard module.

Learning outcomes
Upon completion of this module, students should be able to:
1. Apply the engineering process of problem solving.
2. Design a simple autonomous vehicle to meet a well-defined specification.
3. Clearly demonstrate group working, including task sub-division and integration of individual contributions from the team.
4. Plan a project, meeting all interim deliverables.
5. Implement project tracking and code version control.
6. Apply knowledge of the health and safety requirements of electronic circuit board construction.
7. Recognise issues to be addressed in a combined hardware and software system design.
8. Develop skills in the areas of quantitative analysis, scientific reasoning and communication.
9. Develop practical experimental skills in electronic circuit testing.
10. Develop practical experimental skills in software system testing.
11. Explore and defend their design decisions, critique their own design.
12. Evaluate the outcome of their achievements given the original specification.
13. Demonstrate organised and concise report writing skills.

Module Content

The objectives of this module are:

  to apply basic principles of science and engineering to Conceive, Design, Implement and Operate (CDIO) an autonomous vehicle;

  to introduce group working and project planning;

  to introduce the principles of circuit construction and the health and safety issues associated with electronic circuit construction and the adoption of   test procedures;

  to introduce the principles of software systems design including user interface design and control software for wireless communications;

  to analyse the design and optimise it with respect to manufacturability and testing;

  to introduce the requirements of project documentation, circuit drawings and software documentation;

  to introduce project reporting and presentation.

Teaching strategies

The module is taught using a combination of lectures, demonstration laboratories and through project sessions at which advisors are present. As a 10 ECTS course, the average individual student effort should be 200-250 hours spread over the semester. 55 of these will be actual contact hours. Thus all students, as individuals and as groups, are also expected to undertake extensive independent research and development work on the project.

Assessment

The project is assessed through a combination of:

  interim reports, both individual and group

  individual exercises or quizzes

  a presentation by each group to a panel who will examine the quality of the autonomous vehicle and its operation (includes an individual short exam)

  the submission of a final (single) group report.

Supplemental assessment is by individual coursework to be undertaken over the summer months.

Further information

http://www.tcd.ie/Engineering/undergraduate/baiyear2/2E10