4E2c – Engineering Design Group Project [10 credits]

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Module organisation

Module description, aims and contribution to programme
In the SS Engineering Design Group Project students in teams on an engineering design project, with a focus on design for the built environment. 4E2c is the project option available to students in the second semester.

The 10 ECT for 4E2c is dedicated to a semester long project. Continuous assessment including in class presentations will be allocated 50% of the assessment marks. Final project report and presentation will comprise the other 50%. Lectures hours will be timetabled through the semester. The lecture material is tailored to theory and skills required for the particular project.

Project
The project involves 2 phases;
   1. Group project phase - urban design project (Weeks 1-3)
   2. Individual detailed design phase – building design project (Weeks 4-9)

During the semester students initially work in project teams tasked with the design of a new urban or campus quarter. Each design team must address all aspects of the design from planning, environmental impact and preliminary structural schemes, to transportation and construction.

In the second project phase students work individually to complete the detailed design of a chosen building on the urban site designed in phase 1 of the project.

The objective of this part of the project is to develop student’s “design office” skills and to challenge the students with realistic problems that force them to make decisions even when faced with limited information. Students will become familiar with design practice including the use of codes of practice and commercial engineering design software.

The class and design teams meet regularly at timetabled hours. During these sessions students will also partake in individual exercises designed to improve their presentation skills and their knowledge of professional ethics. This work is assessed and contributes to the students marks for the subject.

The project is assessed through continuous assessment, project presentations and a final project report. Students submit a combination of group and individual work.

Learning outcomes
This module was designed to satisfy certain program outcomes required for Engineers Ireland’s Masters degree accreditation: specifically aspects of outcomes b, c, e, f & g. The module concentrates on outcomes relating to communications, group work, professional and social ethics, sustainability, risk assessment and engineering design practice. The design projects are designed to challenge the students by presenting them with design problems in which some of the input information is incomplete or ill-defined, where other aspects of the problem are unfamiliar and where the students must develop knowledge and understanding of concepts from a range of areas outside engineering.

On completion of the module students will:

1. Be able to integrate knowledge, handle complexity and formulate judgements with incomplete or limited information;
2. Be able to identify and use appropriate mathematical methods, numerical techniques and software tools for application to new and ill-defined engineering problems;
3. Have the ability to apply design methods, processes and techniques to unfamiliar, ill-defined problems, involving other disciplines;
4. Be able to design to codes of practice and industry standards; to identify limitations of codes of practice and the need for their application;
5. Have the ability to redesign products, processes or systems in order to improve productivity, quality, safety and other desired needs;
6. Have the ability to investigate and define a need and identify constraints including health, safety and legal issues and the impact of engineering solutions in a societal and environmental context;
7. Be able to make engineering judgements that take cognisance of the social, environmental, ethical, economic, financial, institutional and commercial considerations affecting the exercise of their engineering discipline;
8. Have the ability to consult and work with experts in various fields in the realisation of a product or system;
9. Have knowledge and understanding of concepts from a range of areas outside engineering;
10. Will be able, via knowledge and understanding of group dynamics, to exercise leadership;
11. Be able to select and apply appropriate communication tools and write technical papers and reports;
12. Will be able to describe succinctly, the relevant advantages and disadvantages of various technologies to a lay audience, and to communicate effectively in public.

Module content
Students attend special lectures, given by academic staff and industry professionals, tailored to the particular project. The lectures will cover 3 primary topics:

1. Design for a sustainable built environment
2. Energy in buildings
3. Building Information Modelling (BIM)

1. Design for a sustainable built environment
History of building design, state of the art in building design, principles of architectural design, innovations in structure, advances in building construction and material technologies, urban design concepts. The impact of the built environment, principles of sustainable design, smart and sustainable cities.

2. Energy in buildings

3. Building Information Modelling
3D building design and modelling, early stage building energy analysis, scheduling, construction and cost management. Energy analysis using Green Building Studio and/or dynamic simulation modelling (IES VE/ EnergyPlus).

Teaching strategies

Assessment

Required textbook