MULTI-DISCIPLINARY DESIGN PROJECT - 2024/5

Module code: ENGM001

Module Overview

Module purpose: This module was conceived to answer the SARTOR 3 requirement that each MEng student participates in a multi-disciplinary design activity. It involves students from Aerospace, Civil, Chemical, Electronic, Mechanical and Medical Engineering working in groups which contain at least 3, and often 4, disciplines. The projects are conceived by Royal Academy of Engineering (RAE) Visiting Professors from Industry (who enjoy the active support of their sponsoring organisation). It aims to emulate an intensive Industrial Design Project.

Module provider

Chemistry and Chemical Engineering

Module Leader

BEHNEJAD Alireza (Sust & CEE)

Number of Credits: 30

ECTS Credits: 15

Framework: FHEQ Level 7

Module cap (Maximum number of students): N/A

Overall student workload

Workshop Hours: 2

Independent Learning Hours: 278

Lecture Hours: 4

Laboratory Hours: 7

Guided Learning: 3

Captured Content: 6

Module Availability

Semester 1

Prerequisites / Co-requisites

N/A

Module content

Working in multidisciplinary groups, students will underake a design project specified by a RAE Visiting Professor from industry and approved by the Academic Steering Committee that manages the module.

Assessment pattern

Assessment type	Unit of assessment	Weighting
Project (Group/Individual/Dissertation)	REPORTS, PRESENTATION, POSTER & VIVA	100

Alternative Assessment

Not applicable: students failing this module resit the whole module in the following academic year, or may choose to leave with a BEng (Honours) Degree.

Assessment Strategy

The **assessment strategy** is designed to provide students with the opportunity to demonstrate their skills in multi-disciplinary group project work.

Thus, the **summative assessment** for this module consists of the following.

1 An Inception Report

Marks are awarded for the clarity, structure, conciseness, quality of explanation and presentation of the report in accordance with the agreed criteria. [Assesses Learning Outcomes 2,3,4,5,6]

Weighting 10% of project total (a group mark)

2 A Final Report

Marks are awarded for the clarity, structure, conciseness, quality of recent academic sources used in your bibliography, quality of explanation and presentation of the report in accordance with the agreed criteria. [Assesses Learning Outcomes 1,2,3,4,5,6]

Weighting 5% of the project total (a group mark)

10% of the project total based on those sections of the report attributed to named individuals (an individual mark)

3 An Executive Proposal

Marks are awarded for the clarity, structure, conciseness, quality of explanation and presentation of this part of the Final Report in accordance with the agreed criteria. [Assesses Learning Outcome 5]

Weighting 5% of the project total (a group mark)

4 Engineering Judgement

Marks will be awarded for the Engineering Judgement demonstrated in the project work based on contact with the students during the course of the project, the reports submitted, the oral presentations and subsequent questions and the oral examination. Marks will be awarded on the basis of the difficulty of the objectives set, the way in which those objectives have been met, the understanding displayed including the impact of project finance, overall rate of progress and level of initiative shown. [Assesses Learning Outcomes 1,2,4]

Weighting 35% of the project total (an individual mark)

5 Sustainability

An important part of Engineering Design is an appreciation of sustainability. It is important, therefore, that you make full consideration of this in your design. You should consider this within the context of, for example, the United Nations' Sustainable Development Goals, the Planetary Boundaries framework (Steffen et al., 2015) and/or Raworth's (2017) Safe Operating Space for Humanity.

Where appropriate, use of tools for the assessment of environmental impact of the project should be used. These will vary according to the nature of the project but may include, for example, Life Cycle Assessment (for assessment at product or plant level), use of Multipliers derived from Environmental Input-Output Models (for assessment at a higher scale such as a community). If using multipliers you should show an understanding of how the multipliers are derived, even if they simply use figures from published databases. Primary and/or secondary data can be used in the assessment, as appropriate.

Assessment should be made of the environmental impacts of the final project design, and how it compares with appropriately chosen alternatives. The assessment should also include discussion of trade-offs that were made between different types of impacts (for example, water use might have been increased in order to reduce greenhouse gas emissions). This discussion may be, if appropriate, in the form of a discussion of the trade-off between the progress towards the various UN Sustainable Development Goals.

An assessment of how future policies might enable the sustainability of the final project design to be enhanced can be included if appropriate. This may include, for example, consideration of taxes/subsidies, and legislation / regulations.

Types of indicators of sustainability might include: Environmental indicators (such as greenhouse gas emissions, water usage, biodiversity etc.); Social indicators (such as child labour, health and safety, respect for indigenous rights etc.); and Financial indicators. [Assesses Learning Outcome 7]

Weighting 5% of the project total (a group mark)

6 Research Skills/Referencing

Marks will be awarded depending upon the quality and appropriateness of the references you use as well as the style of referencing you adopt which should be in line with the library recommendations. [Assesses Learning Outcomes 4]

Weighting 5% of the project total (an individual mark)

7 Oral Presentation

Marks are awarded for the use of the voice, the pace and timing of the presentation, the body language, the presentation introduction and conclusion, the planning and content, the linking between speakers, the quality of visual aids, the use of the visual aids and the overall impression created. [Assesses Learning Outcomes 3,5]

Weighting 5% of the project total (a group mark)

8 Poster Presentation

This element of assessment is the production of an A0 poster for which marks are awarded for quality, structure, content, clarity and presentation. In particular the marker will be looking at the story told by the poster (is it a visual abstract of the project?), the visual appeal, the overall design and layout and the mix of pictures/charts/graphs and text. [Assesses Learning Outcomes 3,5]

Weighting 5% of project total (a group mark)

9 Project Management

Marks will be awarded for the use, upkeep and production of good project management tools during the project. Milestones and deliverables should be assigned and reviewed as a part of the project meetings. The group's ability to keep the project management tool up to date and neither be hampered by it nor ignore it will be evaluated. [Assesses Learning Outcomes 2,6,8]

Weighting 5% of project total (a group mark)

10 Communication and Team-working Skills

Marks will be awarded for each students communication and team-working skills (preparation, clarity of expression, eye contact, use of visual aids, ability to respond to questions, confidence, support of team members, contribution to team discussions etc.) as exhibited during group meetings, the oral presentations and oral exam. This is recorded each week by mutual agreement of the tutors and Visiting Professor. [Assesses Learning Outcomes 3,4,5,6,8]

Weighting 10% of project total (an individual mark)

Allocation of Group Marks

The supervisors award a single mark for each element of the assessment. When the mark is awarded to the group the mark awarded to each student will be this mark multiplied by an individual weighting factor reflecting both the supervisory staffs' and the group members' views of each student's input to the group activity. The weighting factors will be calculated using a confidential response form completed by each group member and submitted to Professor Webb before the Poster Presentation.

Formative assessment and feedback

For the module, students will receive formative assessment/feedback in the following ways.

- Formative assessment is provided from interaction at the formal weekly group meetings where progress by each of the students is discussed.
- Two of the meetings (in weeks 4 and 8) are undertaken with each student in isolation, in order to provide individual feedback to the student on his/her progress and receive feedback from the students on their own opinions of progress.
- Extensive written and oral feedback is provided on the Inception Report at around week 5/6.

Module aims

- This module aims to provide students experience of a complex design activity as a member of a multi-disciplinary design group.

Learning outcomes

		Attributes Developed	
Ref			
001	Undertake a simple financial appreciation of a complex design	CPT	M5
002	Undertake a complex design and integrate it with design components from other disciplines.	KCPT	M1, M2, M3, M5

Ref		Attributes Developed	
003	Communicate the components required to complete the project and how each individual design component is integrated with the others	PT	M4, M6, M13
004	Discuss complex specifications and implement a detailed well referenced technical design evaluating the environmental, societal, and ethical impact of solutions and commercial and any legal aspects	KCPT	M7, M8, M15
005	Explain their disciplines contribution to the project design to others outside of their discipline	KCPT	M14, M17
006	Work with others as a member of an inclusive multidisciplinary team recognising the responsibilities, benefits and importance of supporting equality, diversity and inclusion	KPT	M11, M16
007	Appreciate the need and risk involved in innovation	PT	M9, M10
008	Organise and participate in formal minuted project meetings.	PT	M16, M18

Attributes Developed

C - Cognitive/analytical

K - Subject knowledge

T - Transferable skills

P - Professional/Practical skills

Methods of Teaching / Learning

Mechanisms of teaching and learning used in the module include the following.

- Weekly meetings with the RAE Visiting Professor from industry and members of academic staff.
- Consultations with other members of academic staff acting as subject experts.
- Lectures on specialist subjects e.g. Project Finance, Innovation, Research Methods, etc.

Indicated Lecture Hours (which may also include seminars, tutorials, workshops and other contact time) are approximate and may include in-class tests where one or more of these are an assessment on the module. In-class tests are scheduled/organised separately to taught content and will be published on to student personal timetables, where they apply to taken modules, as soon as they are finalised by central administration. This will usually be after the initial publication of the teaching timetable for the relevant semester.

Reading list

https://readinglists.surrey.ac.uk
Upon accessing the reading list, please search for the module using the module code: ENGM001

Other information

Employability: This programme will produce graduates of high employability where they will be able to apply engineering skills to an open ended and industrially related problem and develop knowledge and confidence to be able to contribute to the needs of the wider engineering industry in the context of current economic, social and environmental pressures. Graduates will develop transferrable skills such as time management, organisation, problem solving, teamwork, report writing, presentation and communication that are well sort after by employers of all disciplines.

Digital Capabilities: Graduates will have skills, knowledge, and attitudes that enable confident, critical, and creative use of a wide range of digital technologies for information, communication, and problem-solving in engineering which can also be applied to all aspects of life. Graduates will gain understanding in the benefits and risks of digitalisation and adopt a holistic and proportionate approach to the mitigation of security risks using process, cyber and automation, and behavioural measures.

Global and Cultural Skills: the programme is taught in an interactive and collaborative way, in a cohort that commonly represents a wealth of nationalities, backgrounds and engineering disciplines i.e. Aerospace, Civil, Chemical, Electronic, Mechanical and Medical. Graduates would have engaged and learnt from diverse perspectives through interaction and teamwork. In addition, graduates will have an understanding of the global responsibilities as an engineer and to minimise impact on society and environment.

Resourcefulness and resilience: Graduates will develop an opportunity-centred mindset and leadership, demonstrating confidence in responding effectively to opportunities, challenges, problems, working under pressure and setbacks, reflecting and learning from own performance and experiences, and dealing with conceptually challenging real life engineering processes.

Sustainability: Graduates will have awareness and understanding the ethical, social and environmental responsibilities as an engineer in designing, developing and operating processes that are more sustainable, efficient and minimal environmental impact.

Programmes this module appears in

Programme	Semester	Classification	Qualifying conditions
Aerospace Engineering MEng	1	Compulsory	A weighted aggregate mark of 50% is required to pass the module
Automotive Engineering MEng	1	Compulsory	A weighted aggregate mark of 50% is required to pass the module
Biomedical Engineering MEng	1	Compulsory	A weighted aggregate mark of 50% is required to pass the module
Chemical and Petroleum Engineering MEng	1	Compulsory	A weighted aggregate mark of 50% is required to pass the module
Chemical Engineering MEng	1	Compulsory	A weighted aggregate mark of 50% is required to pass the module
Civil Engineering MEng	1	Compulsory	A weighted aggregate mark of 50% is required to pass the module
Computer Science MEng	1	Compulsory	A weighted aggregate mark of 50% is required to pass the module
Mechanical Engineering MEng	1	Compulsory	A weighted aggregate mark of 50% is required to pass the module

Please note that the information detailed within this record is accurate at the time of publishing and may be subject to change. This record contains information for the most up to date version of the programme / module for the 2024/5 academic year.