AEROSPACE GROUP DESIGN PROJECT - 2024/5

Module code: ENG3216

Module Overview

The Aerospace Group Design Project provides students with the opportunity to work on a complete aerospace vehicle design study, in response to a project brief defined in collaboration with industry. Students can extend and broaden their subject knowledge and further develop technical, team working and management skills. Over the lifecycle of the project, there will be changing priorities and responsibilities, so a group will need to adapt their team organisation, their choice of sub-groups and their allocation of individual roles, for each phase of the project. Technical quality, integration, comprehension, creativity, team working, communication and project management are all part of the experience.

Module provider

Mechanical Engineering Sciences

Module Leader

DOHERTY John (Mech Eng Sci)

Number of Credits: 30

ECTS Credits: 15

Framework: FHEQ Level 6

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

Overall student workload

Independent Learning Hours: 240

Lecture Hours: 10

Tutorial Hours: 22

Guided Learning: 18

Captured Content: 10

Module Availability

Year long

Prerequisites / Co-requisites

None

Module content

Indicative content includes:

- Groups of students carry out a complete aerospace vehicle design study, in response to a project customer need
- Each student group will first complete a system requirements review, considering functional, performance and regulatory requirements
- In the next phase, the group evolves an initial concept to address these requirements, considering technology maturity levels, leading to a preliminary design review
- In the final phase, the baseline design is refined and matured, leading to a critical design review
- Team organisation, planning and project decisions are controlled by the group
- Project tasks are progressed through a mix of individual and team working
- Group and individual activities are communicated to the project customers through weekly meetings, minutes of meetings, oral presentation and reporting
- Each member should demonstrate integrated team working, technical achievement, task leadership and chairing/minuting of meetings

Assessment pattern

Assessment type	Unit of assessment	Weighting
Coursework	SYSTEM REQUIREMENTS REVIEW (SRR)	10
Coursework	PRELIMINARY DESIGN REVIEW (PDR)	25
Project (Group/Individual/Dissertation)	PERFORMANCE SEMESTER 1	20
Coursework	CRITICAL DESIGN REVIEW (CDR)	25
Oral exam or presentation	ORAL PRESENTATION AND DEFENCE	5
Project (Group/Individual/Dissertation)	PERFORMANCE SEMESTER 2	15

Alternative Assessment

Attendance at weekly group meetings with the project customer is an essential part of overall performance assessment. Non-attendance at a large number of meetings may mean key aspects of group working, such as team working and communication, cannot be assessed and may lead to a requirement to the resit the module in a subsequent year. Any group assessment unit is awarded a single group mark, but a zero mark can be assigned to an individual who has not contributed. If any group assessment unit is failed, then an alternative individual assessment can be offered. If any individual coursework assessment unit is failed, but attendance at meetings is considered sufficient for overall performance assessment, then an alternative individual assessment can be offered.

Assessment Strategy

The assessment strategy is designed to provide students with the opportunity to demonstrate:

- ability to understand, identify and document functional, performance and regulatory requirements (SRR)
- ability to evolve a solution, against a set of requirements, through initial concept ideas, down-selection, outline design (PDR) and detailed refinement (CDR)
- ability to work effectively in a group, together with demonstrating specific task leadership and planning
- ability to develop new individual skills, understanding and knowledge
- ability to present work clearly and concisely

The summative assessment for this module consists of:

- Systems Requirement Review (SRR) [Learning outcome 1, 4, 6]
- Preliminary Design Review (PDR) [Learning outcome 1, 2, 3, 6]
- Critical Design Review (CDR) [Learning outcome 1, 2, 3, 6]
- Oral Presentation and Defence [Learning outcome 1, 2, 5]
- Performance Semester 1 and 2 [Learning outcome 2, 4, 5, 6]

Formative assessment of individual performance is provided at regular intervals during the project.

Peer assessment will encourage students to recognise and value the contribution of each team member.

Verbal feedback is given during the weekly meetings with the customer, which is captured within formal meeting minutes. Feedback is also given at the end of each design phase.

Module aims

- An understanding of a complex aerospace vehicle design lifecycle, using a system engineering approach, progressing through design phases and reviews, with consideration of customer, end-user, business, societal and regulatory needs.
- Knowledge of each stage of the design process, including system requirements definition, conceptual design and preliminary design, with consideration of downstream manufacturing, certification, operation and disposal.
- A critical awareness of the importance of iterative project planning, ensuring efficient/effective use of all group resources, with associated management of project risks
- A comprehensive understanding of effective and inclusive team working to achieve design goals
- An understanding of the need for flexibility and adaptability throughout the design process, including development of new individual skills and subject knowledge through background research and technical literature review.

Learning outcomes

Ref		Attributes Developed	
001	Consider customer and regulatory needs to define overall system requirements for a complex aerospace vehicle design, then apply scientific principles/methodology to evolve an integrated and evaluated preliminary design.	KCT	C5, M6, C1, C2, C4
002	Plan and manage within a team and apply relevant systems engineering and project management techniques, to ensure that integrated design solutions are derived on time and meet the overall system requirements	KCPT	C6, C9, M9, C15, M15
003	Develop and apply advanced problem-solving skills, engineering knowledge and understanding to develop rigorous and creative solutions and to analyse/evaluate them in terms of performance and functionality, including environmental, economic and societal impact	KCT	C5, C7, C13, M13
004	Adjust one¿s individual approach and attitude within a project group, to utilise all team resources and to ensure effective/efficient team working	CT	C11, M11, C16
005	Demonstrate the ability to clearly communicate and present work to different audiences	PT	C17
006	Demonstrate the ability to communicate and work flexibly within a group endeavour, ensuring overall approach is integrated, while adapting to constantly changing needs during the project	CT	C16, C6, M6

Attributes Developed

C - Cognitive/analytical

K - Subject knowledge

T - Transferable skills

P - Professional/Practical skills

Methods of Teaching / Learning

The learning and teaching strategy is designed to:

Support students as they undertake a group design project activity. Each student group acts like a design/consultancy team,

responding to a customer need. The group must organise themselves, coordinating inputs from individuals. All team members will need to carry out research and develop new skills and knowledge to address the needs of the project. Module teaching staff act as project customers, who will want to see technical quality and effective team working being maintained throughout. Customers will comment upon presented progress and seek justification for decisions made or approach followed. The overall project is broken up into phases, with separate assessments associated with each phase, to allow regular feedback to support development.

The learning and teaching methods include:

Introductory lecture to highlight the differing project phases, how assessment is carried out, the role of the project customers and what is expected from students. Subsequent lectures are provided during the early stages of the project and include systems engineering processes, regulatory frameworks and relevant topics in aerospace vehicle design.

Weekly meetings between each student group and one or more module staff acting as project customers. All group members should present progress each week, enabling customers to feedback through comments, questions and constructive criticism.

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: ENG3216

Other information

The School of Mechanical Engineering Sciences is committed to developing graduates with strengths in Employability, Digital Capabilities, Global and Cultural Capabilities, Sustainability and Resourcefulness and resilience. This module is designed to allow students to develop knowledge, skills and capabilities in the following areas:

Employability: This module provides students with the opportunity to develop and demonstrate professional skills which are central to a career in aerospace engineering. Students will gain a working knowledge of the lifecycle stages of a complex aerospace vehicle design, using a systems engineering approach. Students can demonstrate effective team working, adapting their approach and attitudes, responding to different personality traits in team members and improving communication skills for different audiences. Students further develop their project management skills, by helping to plan group work, making the most effective use of available resources, assigning roles/responsibilities and ensuring targets are met.

Digital Capabilities: As a member of a group tackling a complex engineering design, students will address numerous project activities that arise, within which various software capabilities may be relevant. It is likely that data management and CAD software will need to be collaboratively applied by each member, in order to develop an integrated aerospace vehicle solution. Other potential software will depend upon the particular project and could include rapid tools for structural analysis, aerodynamic analysis, systems modelling etc. Students may also develop software for simulation, data-processing, visualisation and presentation. Finally, project management tools may also be used as part of project planning.

Global and cultural responsibilities: Allocation of students to each project group is random, so all students will experience working with a new team of people. This will require students to engage effectively and respect the interests of people from various backgrounds and cultures. Students will interact, communicate and build relationships across the team, as a result of a common focus on driving the project forward successfully. Peer assessment will encourage students to recognise and value the contribution of each team member.

Sustainability: The project briefs provided to students at the start of the project represent real world aerospace vehicle design challenges, within which sustainability is central, alongside performance, cost, risk etc.

Resourcefulness and Resilience: Students will need to develop resourcefulness, be able to share ideas and experiences both individually and collectively, appreciate potential barriers and challenges faced by others and provide support and show empathy towards each other in working towards achieving successful outcomes and responding to problem-based task requirements.

Programmes this module appears in

Programme	Semester	Classification	Qualifying conditions
Aerospace Engineering BEng (Hons) (YEAR LONG)	Year-long	Compulsory	A weighted aggregate mark of 40% is required to pass the module
Aerospace Engineering MEng(YEAR LONG)	Year-long	Compulsory	A weighted aggregate mark of 40% is required to pass the module