UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Systems Engineering Design Team Project
Module Code	ENG7012-D
Academic Year	2024/5
Credits	40
School	School of Engineering
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Lectures	16
Tutorials	16
Project Supervision	16
Directed Study	352

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year
BDA	University of Bradford / Non Standard Year

Module Aims

The aim of this module is to provide the advanced knowledge base necessary to bring a complex product, system or project to a successful delivery, through a systematic approach to product development and systems engineering, deployed within a multi-disciplinary context representative of the dynamics of real world engineering design teams.
Students will develop advanced skills in systems engineering design and product development processes, as well as project management, and strong personal skills for team performance management.

Outline Syllabus
1. Introduction to Competitive Design; Product development frameworks and processes; Total design and Axiomatic design principles; the Failure Mode Avoidance framework for lean product development; overview of systems engineering analysis. 2. Function analysis tools - Boundary Diagram, Interface Analysis, System State Diagram, Function Tree 3. Systems engineering methods and tools: Stakeholder mapping; Use Case analysis; Feature function analysis. 4. FMA Management tools: Function Failure Modes and Effects Analysis (FMEA); Function Fault Tree Analysis (F-FTA) 5. Robust Design analysis: Noise Factors Analysis through P-Diagram; Noise Factor Management Strategy through Robustness Checklist. 6. Robust Design Verication Process - development and management through Robustness Demonstration Matrix and Design Verification Plan. 7. Systems Engineering analysis and design process integration and management.

Learning Outcomes	
Outcome Number	Description
01	Critically evaluate the complex nature of the processes involved in product development operations and the inherent multidisciplinarity of modern systems engineering design.
02	Explain the principles of axiomatic design, consumer focused engineering and robust engineering design.
03	Discuss approaches to manage complexity in modern systems engineering based on structured design methods.
04	Justify the selection of a framework and process for product development.
05	Demonstrate your ability to plan and complete the design of an interdisciplinary system, product or project by using a formal product development framework.
06	Demonstrate your ability to apply formal design tools for function analysis and decomposition, and function failure mode analysis.
07	Apply formal tools for innovation and countermeasure development.
08	Develop and implement strategies for robustness improvement and development of robust design verification methods.
09	Demonstrate ability for systematic problem solving; Demonstrate skills in data management; data presentation; and data interpretation; Demonstrate enhanced skills for communication, teamwork, leadership, and personal management.

Learning, Teaching and Assessment Strategy

TEACHING AND LEARNING:

Product design and development frameworks, processes and tools, will be introduced with a series of short-course style lectures. The module will start with a short course teaching block which will cover methods and tools for product development and systems engineering design (including formal design methods, failure mode avoidance, and team management techniques), delivered in a workshop style.

Most of the materials used in the module have been developed though collaborative work with industry, developed on the principles of constructivist learning within a problem based teaching context. Reference to real-world engineering experience and case studies based on current and recent applied research are made throughout the module.

Industry / expert guest lectures will cover specialist topics such as sustainability and ethics in design. Students will work in interdisciplinary teams on an industry project, where they will apply the methodologies covered in the technical sessions, in combination with discipline specific engineering modelling methods, to develop solutions for a complex system design task. The industrial sponsors will provide mentoring and feedback to the teams, in addition to technical information pertinent to the project.

The directed study hours encompass independent study and working in groups. This could include access to the workshop for prototype development in the second study period, if conditions allow.

ASSESSMENT:

The team-based design project report will be the basis for assessment. Student work is supported with weekly project clinics, where they receive feedback from the module lecturers. Students complete the work within a real-world product development scenario, with simulated gateways where they present their progress and submit interim technical reports, in front of academic and industrial mentors, on which they receive feedback.

The assessment is based on team presentation (20%) and the team technical report (80%) - each incorporating two interim stages and a final submission. The interim submissions carry a small weight in the overall report mark (1st submission - 10%; 2nd submission - 20%), reflecting the formative element of these submissions. Each team presentation is assessed independently and the presentation mark is the average of the the three presentations.

Peer feedback and assessment is considered for each presentation (the students use the same assessment and feedback rubric as the academic assessors to provide feedback to their peers). The overall individual student marks for the assessments are based on the team mark moderated by the individual contribution to teamwork, using the peer evaluation of individual contribution to different aspects of the project teamwork.

This module satisfies the below Learning Outcomes as specified by the Accreditation of Higher Education Programmes: Fourth Edition (AHEP4) as published by the Engineering Council in-line with the UK Standard for Professional Engineering Competence (UK-SPEC). These outcomes specify five key areas of learning which partially (C) or fully (M) meet the academic requirement for CEng registration: Science and Mathematics (1), Engineering Analysis (2-4), Design and Innovation (5-6), The Engineer and Society (7-11), and Engineering Practice (12-18). Further details of these learning outcomes can be found at https://www.engc.org.uk/ahep/

M1, M2, M4, M5, M6, M7, M8, M10, M13, M15, M16, M17, M18,

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Presentation	Team-based project: 2 progress presentations and 1 final presentation	20%
Summative	Dissertation or Project Report	Team-based project: 2 interim reports and 1 final report (6000 words per student)	80%
Referral	Coursework - Written	SUPPLEMENTARY if required: Re-presentation of individual student's contribution to the group project (6000 words)	100%
Formative	Self and Peer Assessment	Peer feedback on team presentations; peer evaluation of teamwork contribution	N/A
Formative	Coursework - Written	Academic/mentor feedback provided on the 2 project report interim stage submissions	N/A

Reading List
To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:
This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.

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