Module Specification

Masters Group Capstone Project

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Part 1: Information

Module title: Masters Group Capstone Project

Module code: UFMF8T-60-M

Level: Level 7

For implementation from: 2024-25

UWE credit rating: 60

ECTS credit rating: 30

College: College of Arts, Technology and Environment

School: CATE School of Engineering

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: The Masters Group Capstone Project forms a major part of the undergraduate (integrated Masters) degree programmes in Mechanical, Automotive and Aerospace Engineering. The aims of the activity can be summarised as follows:

To undertake a realistic, authentic and substantial engineering design challenge. The scope and scale of the project opportunities available come from a wide variety of sources and industrial partners. Students are given the opportunity to understand the

vital role that technical creativity, design evaluation and detail design activities play in developing new products, machines and systems.

To learn how to work as a member of a group to achieve a project goal. Almost all engineering in industry is achieved as a group effort in order to meet project goals on a commercially viable time-scale. Given the complexity of modern systems, it is also unlikely that a single individual would possess all of the technical skills likely to successfully achieve project aims.

To understand how engineering fits into the wider commercial environment. In any enterprise or business there are almost always constraints on time, finance and other resources. Quite often the better technical solution may not be the better commercial solution. Thus, as well as a technical design, each group will have to deliver a business plan.

Rarely, there will be a single 'right answer'. The assessments for this module are predominantly based on the critical analysis of a project goal and the selection and justification of the chosen solution. The process itself is as important as the technical solution. The right answer is the answer that the group believes to be right and can justify and defend using analysis, embodiment, modelling and alignment to the customer needs. The aim of this module is to help students develop and learn these skills through the execution of a project.

Features: Not applicable

Educational aims: The aim of this module is to give each student the experience of a real design situation as part of a group. This unit builds on the evaluation stage, leading to a detailed design that takes into account both engineering and business aspects.

Outline syllabus: To support the business dimension of the project, some of the fundamental material on finance, organisation and the elements of design are delivered in the form of lectures at the start of the project and mid way through.

The subject areas include:
Business organisation and core processes

Commercial and technical risk management
Environmental, sustainability and ethical considerations in business
Financial accounting and budget control
Intellectual property and patents
Product development strategy

Project topics have been gathered from various sources with and outside the University. Clearly, the nature of the project vary, so cannot be explicitly defined as part of the syllabus of the module. Students will have a sound knowledge base from the programme studied in previous years to cover the technical aspects of the project.

Part 3: Teaching and learning methods

Teaching and learning methods: Students are pre-allocated into groups, which is typical of most industry settings where the company assigns engineers to a particular project. Student engineers need to develop a professional working relationship with all members of the group. Students are assigned to projects and groups that are intended to enable complete engagement for all involved. Groups may be a mix of Mechanical, Automotive and Aerospace students. Groups sizes are nominally six. All groups are balanced in terms of academic ability and industrial placement experience.

Within each group, each student has two roles: the primary role will be focussed on technical issues, whilst the secondary role is as a commercial specialist. It is expected that every student contributes to the technical development of the project as well as making a contribution to the commercial aspects of the project.

Each group will have two academics allocated to supervise and assess each of the deliverables. One will act as the Project Supervisor, and maintain regular contact with the group, whilst the other will act as the Project Assessor and will not be directly involved in the weekly meetings. Both academics will assess all of the technical reports and drawings. The Project Assessor is there to provide an objective

second opinion on the assessments through the course of the module and should not normally be considered to be a second supervisor.

Project groups are expected to meet regularly independently of the meetings with academic supervisors.

Each member of the group will be expected to reflect on and illustrate how their role as a technical engineer and as a commercial 'professional' interact.

Each group will select a project manager early on, who is responsible for the planning and the execution of the whole project. The PM will encourage and support every member of the team to do the best that they possibly can.

Business roles are typically: business manager, marketing executive, sales executive, product executive, operations executive and finance executive.

Two formal formative activities will take place:

• Technical Group Seminar: Short presentation by the group, followed by brief Q&A session from the seminar panel. The group will present a summary answering questions around context, business strategy, market environment, profile of typical customer, needs of the customer/user, and regulatory and external constraints. This seminar itself is formative, but the participation would be reflected in the peer assessment of the group report.

• Business Group Seminar: Each group will prepare and present a seminar describing the key business/commercial considerations of the project as it enters the detailed embodiment stage of the design process. The aim is to present the commercial proposal as it begins to mature. Each member of the group will be expected to present a section relevant to their commercial role within the group. The timing is 15 minutes with 15 minutes Q&A. This seminar itself is formative, but the participation would be reflected in the peer assessment of the group report

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Plan and manage the engineering design process, involving applying and evaluating concepts from a range of areas using engineering analysis techniques in the solution of unfamiliar problems. (EA6m, EL3m, SM6m, P1, P4m, P9m, P10m,)

MO2 Develop and evaluate a business plan informed by the commercial and entrepreneurial opportunities present in an engineering design solution (D5, EL7m)

MO3 Explain and critique the responsibilities of working in a multi-disciplinary team and managing the roles (P1m, G1, G2)

MO4 Generate an innovative and sustainable design for products, systems, components or processes to fulfill new needs (D8m, EL4)

MO5 Identify quality issues during the development and management of the project and their application to continuous improvement (P7)

MO6 Describe the commercial, economic, legal and social context of their design decisions, including professional and ethical conduct and health and safety issues, and evaluate environmental and commercial risk [EL2, P5, EL1m, EL5m, EL6m].

Hours to be allocated: 600

Contact hours:

Face-to-face learning = 36 hours

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/49CE30C4-7D4E-82E3-7645-8BD5C9DEBFA3.html?lang=en-gb&login=1

Part 4: Assessment

Assessment strategy: The assessment of this module is made up a number of elements, split in two broad areas (Part 1 and Part 2).

The system/device/process being developed can be broken into a number of sub-systems, then individuals are assigned the responsibility of each sub-system/area of work (Work Packages).

Part 1.

The purpose of this phase is to develop and review alternative concepts and their associated costs and risks. This element of work will be assessed through one group report ('Written Assignments') comprising a Project Proposal and an analysis of Technical and Commercial Feasibility.

The group submission of an overview report which will describe the overall product or system solution and incorporates topics including: background; customer needs analysis; target requirement specification; principal areas for investigation; and key commercial considerations. From this, a bill of requirements will be determined from which alternative concepts can be developed. A down-selection process should be followed where the preferred option is presented with justifications for the decision. This proposed solution can then be used to inform project planning (Work Breakdown Structure, Schedule, Technical Risk Register). The report concludes with a formal project proposal (with preliminary general assembly).

Part 2

The main tasks for this part of the module are to consider the Design, Verification and Implementation and Production stages and the Business Plan, both delivered as 'Written Assignments'. At the end of this part each group will have produced a set of materials that are comparable to a proposal in industry that would be presented to senior management to make the case for the product or service to enter full-scale development, production and service.

• Project Business Report: This group business plan (submitted as 'Written Assignment') will contain the details of the commercial proposition that accompanies the complete technical proposal. A strict format is to be followed for this element of

work, covering: the Business Description; the Market Analysis; the Business Model; the Sales Strategy; and Finance. The aim is to make a compelling case for supporting the project. The submission should be divided into two parts, comprising the Business Plan (5000 words) and Supporting Evidence (50 pages, max, as an appendix). This assessment will include an element of peer assessment, giving students the opportunity to grade the performance of the other members of the group in relation to the preparation and delivery of the business plan.

• Individual Technical Reports: All members of the team are required to submit an individual technical report ('Written Assignment') for their specific work package or sub-system. This individual report will contain all of the essential technical information supporting the proposed solution including a set of engineering drawings, technical data, references and other models and simulations. The Project Manager's technical report has a slightly different set of criteria, as needs to address the complete product/system/device and recognises the role in managing and coordinate the group. The technical demands of the PM are expected to be reduced in comparison with other members of the group. Full system integration is expected to be covered in the PM's submission, so general assembly drawings are required.

Posters: The culmination of the Capstone Project is a Project Exhibition, held as part of the end-of-year Degree Show. The students will prepare a 'trade-stand' style presentation, supported by posters (including demonstrations of prototypes or models), and will be assessed by a panel of academic staff. Students will be interviewed by the panel and are expected to present a short synopsis of the project, the proposed solution and the key technical features.

Peer assessment will be performed to extract individual marks from group submissions. Group mark will be scaled dependent on peer assessment of engagement (attendance, contribution and completion of actions).

Resit assessment profile is same as first sit.

Resit deliverable(s) will be scaled appropriately to group size and task complexity,

Assessment tasks:

Written Assignment (First Sit)
Description: Group Project Proposal Report including Technical and Commercial Feasibility analysis (15 page maximum, inc. Figure/Tables/References, excluding unmarked appendices)
Weighting: 20 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO2, MO3, MO4, MO6

Written Assignment (First Sit)
Description: Project Business Report. Includes peer assessment (5000 words).

(Commercial viability assessment)
Weighting: 20 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO2, MO3

Written Assignment (First Sit)
Description: Individual Technical Reports plus Individual Technical Drawings (including Project Manager's Report) (20 pages including FIgures/Tables/References.) Appendices are unmarked.
Weighting: 35 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO3, MO4, MO5

Poster (First Sit)
Description: Trade Stand style poster presentation. 4 A1 posters covering technical details of concept and commercial perspective.
Weighting: 25 %
Final assessment: Yes

Group work: Yes
Learning outcomes tested: MO3, MO4, MO6

Written Assignment (Resit)
Description: Group Project Proposal Report including Technical and Commercial Feasibility analysis (15 page maximum, inc. Figure/Tables/References, excluding unmarked appendices).

Resit deliverable(s) will be scaled appropriately to group size and task complexity
Weighting: 20 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO2, MO3, MO4, MO6

Written Assignment (Resit)
Description: Project Business Report. Includes peer assessment (5000 words)

Resit deliverable(s) will be scaled appropriately to group size and task complexity
Weighting: 20 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO2, MO3

Written Assignment (Resit)
Description: Individual Technical Reports plus Individual Technical Drawings (including Project Manager's Report) (20 pages including FIgures/Tables/References.) Appendices are unmarked.
Weighting: 35 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO3, MO4, MO5

Poster (Resit)

Description: Trade Stand style poster presentation

Resit deliverable(s) will be scaled appropriately to group size and task complexity
Weighting: 25 %
Final assessment: Yes
Group work: Yes
Learning outcomes tested: MO3, MO4, MO6

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Aerospace Engineering [Sep][SW][Frenchay][5yrs] MEng 2020-21

Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][5yrs] MEng 2020-21

Mechanical Engineering [Sep][SW][Frenchay][5yrs] MEng 2020-21

Automotive Engineering [Sep][SW][Frenchay][5yrs] MEng 2020-21

Aerospace Engineering [Sep][FT][Frenchay][4yrs] MEng 2021-22

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][4yrs] MEng 2021-22

Automotive Engineering [Sep][FT][Frenchay][4yrs] MEng 2021-22

Mechanical Engineering [Sep][FT][Frenchay][4yrs] MEng 2021-22