ES1B1-15 Engineering Design and Application

22/23

Department
School of Engineering
Level
Undergraduate Level 1
Module leader
Javier Munguia
Credit value
15
Module duration
24 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

Designers use a range of both technical and process based skills combined with a design mindset to synthesise appropriates solution that satisfy the various constraints and stakeholders of a problem. Their efficiency and success depend on judicious use of analysis, experience and creativity. This module will introduce introduce some of the foundational skills needed to approach a range of design problems.

Module aims

Demonstrate the ability to generate innovative designs and solutions to problems with a predominantly electromechanical emphasis.
Design for an issue of a multi-disciplinary nature and the ability to collaborate effectively across teams.
Deliver and communicate a solution of an interdisciplinary product or service delivered via a compelling presentation

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

1. Generic design process: Applicable to any engineering product, programme, system or software. Project management of design needs and requirements. Specifications (Assessing the Problem)
2. Application of engineering theory: The use of Engineering theory to understand a problem and inform concepts. Reverse engineering (Research)
3. Conceptualisation of solutions: Hand-drawn concepts, collaboration, Computer aided design (CAD), aesthetics, design automation. Integrated mechanical and electrical\electronic design. Design for manufacture. Design communication (Ideas)
4. Construction of prototypes: First embodiment. Prototyping technologies. Systems integration. (Prototypes)
5. Analysis and optimisation in design: Simulation, testing of prototypes, data capture and analysis. Design automation. In-service monitoring. (Testing and Validation)
6. Final design embodiment: 3D solid modelling and 2D engineering drawings. Detailed design for manufacture. Second embodiment. Design communication. (Final Designs)
7. Solution realisation: Manual and digital manufacturing methods. Cyber-physical systems. (Manufacturing). Team-working and communication skills.

Learning outcomes

By the end of the module, students should be able to:

- Imagine and create innovative products and solutions that are fit for purpose
- Balance competing technical, commercial, regulatory, socio-environmental requirements in engineering design
- Apply a methodical approach to the solution of design problems from design conceptualisation through to design verification
- Use computational tools to aid the application of theoretical models to the quantitative design of functional components
- Develop effective team-working practices
- Develop effective communication behaviours
- Produce mechanical and electrical designs / drawings / sketches using Computer Aided Design(CAD) and manual systems.
- Establish and report engineering design briefs.

Indicative reading list

1. Shigley's Mechanical Engineering Design, Budynas, R.G., Nisbett, K.J.,2014. McGraw-Hill Education. ISBN : 978-9814595285.
2. Product Design, Otto, K. & Wood, K., 2001. Pearson. ISBN : 978-0130212719.

Interdisciplinary

Examples used for illustrative purposes should be of an interdisciplinary nature and student work should reflect this aim

Subject specific skills

Self-motivated, work independently and take responsibility for their actions. Set themselves challenging personal targets and make own decisions.
Communicate confidently to create and maintain working relationships. Be respectful.
Work collaboratively as a team player. Able to work effectively within a team and interact with /help others when required.
Prioritise quality. Follow rules, procedures and principles in ensuring work completed is fit for purpose, and pay attention to detail / error checks throughout activities.
Adjust to different conditions, technologies, situations and environments and to new and emerging technologies.
Exercise responsibilities in an ethical manner, with openness, fairness and honesty.
Respect the environment and the public good. Consider sustainability and the adverse effects of projects and tasks on the wider world, in the short and longer term.
Commit to personal learning and professional development.

Transferable skills

Communicate technical information with others at all levels, including technical reports and the use of digital tools.
Follow a methodical approach to engineering problem-solving.
Establish and report engineering design briefs.
Produce mechanical and electrical designs/drawings / sketches using Computer-Aided Design(CAD) and manual systems.
Model real-world mechanical systems efficiently.
Select the design solution for a given electro-mechanical engineering application and environment using data to inform their decisions.
Integrate electrical and mechanical engineering systems, considering new and emerging technologies.
Use appropriate equipment to develop and execute test plans to support electro-mechanical product validation and approval.
Fabricate engineering components and assemblies using specialist manufacturing methods and hand fitting techniques.
Comply with statutory and organisational safety requirements.

Study

Study time

Type	Required
Lectures	6 sessions of 1 hour (4%)
Seminars	2 sessions of 2 hours (3%)
Practical classes	5 sessions of 2 hours (7%)
Supervised practical classes	6 sessions of 2 hours (8%)
Work-based learning	52 sessions of 1 hour (35%)
Online learning (scheduled sessions)	10 sessions of 1 hour (7%)
Online learning (independent)	(0%)
Private study	56 hours (37%)
Total	150 hours

Private study description

56 hours guided independent learning (including VLE use).

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Individual Design Portfolio	40%		Yes (extension)
A individual design portfolio showcasing the skills acquired during the prior learning and learning on campus. Submitted after the week on campus - 12 pages of A4 (or A3 equivalent)			
Reassessment component is the same			
Assessment component			
Group Design Portfolio	40%		No

	Weighting	Study time	Eligible for self-certification
A group design portfolio showcasing the work done as a group during the week on campus as part of the electromechanical group design project - 20 A4 pages (or A3 equivalent)			

Reassessment component

Individual Design Assignment Resit - 2 An individual design assignment - 8 pages of A4 (or A3 equivalent)			No

Assessment component

Group Presentation to Peers	20%		No
A group design presentation showcasing the work done as a group during the week on campus as part of the electromechanical group design project.			

Reassessment component

Individual Design Assignment Resit - 1 An individual design assignment - 8 pages of A4 (or A3 equivalent)			No

Feedback on assessment

Written and verbal feedback on portfolios and presentation.

Availability

Courses

This module is Core for:

- Year 1 of DESA-H360 Undergraduate Electromechanical Engineering (Degree Apprenticeship)