ES192-15 Engineering Design

24/25

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

Description

Introductory description

ES192-15 Engineering Design

Module web page

Module aims

Design is a major activity within all branches of engineering. Similar design methods and skills can be applied at many levels of detail from the conceptual arrangement of a complex system down to the physical embodiment of its constituent parts. Designers use a range of skills and a repertoire of prior knowledge to synthesise an appropriate solution that satisfies the various constraints of the problem. Their efficiency and success depend on judicious use of analysis, experience and creativity.

Modern designers need to possess a range of skills, including; the ability to generate innovative designs and solutions to problems, the ability to design for a particular manufacturing process, the ability to collaborate effectively across teams and the ability deliver compelling presentations of designs. While the delivery of precise and detailed engineering designs is a key skill, the impact of pervasive simulation tools, automated and generative design tools, as well as cloud computing and cyber-physical systems means that designers of the future will require both traditional design and manufacturing knowledge as well as a whole new repertoire of skills.

This module aims to introduce students to the complexities of the design task and equip them with some of the techniques and experience required to design for a function and manufacturing/construction process within their discipline.

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 that are fit for purpose;[C1(D), C4(D), M1(D), M4(D)]
- Balance competing technical, commercial, regulatory, socio-environmental requirements in engineering design; [C2(D), C5(D), C7(D), M2(D), M5(D), M7(D)]
- Apply a methodical approach to the solution of design problems from design conceptualisation through to design verification; [C2(D), C6(D), C12(D), M2(D), M6(D), M12(D)]
- Use computational tools to aid the application of theoretical models to the quantitative design of functional components; [C3(D), M3(D)]
- Develop effective project management skills; [C14(D), M14(D)]
- Individually or as part of a team, develop effective communication behaviours. [C16(D), C17(D), M16(D), M17(D)]
- Design solutions for problems which include health & safety, diversity, inclusion, cultural, societal and environmental matters [C11, M11]

Indicative reading list

1. The design thinking toolbox: a guide to mastering the most popular and valuable innovation methods by Michael Lewrick; Patrick Link; Larry J. Leifer 2020.
2. Product design and development by Karl T. Ulrich; Steven D. Eppinger; Maria C. Yang 2020

Seventh edition.
3. Manual of engineering drawing: technical product specification and documentation to British and International standards by C. H. Simmons; D. E. Maguire; Neil Phelps c2012 4th ed.

View reading list on Talis Aspire

Subject specific skills

1. Plan and manage the design process, including cost drivers, evaluating outcomes, and working with technical uncertainty.
2. Ability to apply relevant practical and laboratory skills.

Transferable skills

1. Numeracy: apply mathematical and computational methods to communicate parameters, model and optimize solutions
2. Apply problem solving skills, information retrieval, and the effective use of general IT facilities
3. Communicate (written and oral; to technical and non-technical audiences) and work with others
4. Exercise initiative and personal responsibility, including time management, which may be as a team member or leader

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Study

Study time

Type	Required
Lectures	9 sessions of 1 hour (6%)
Seminars	3 sessions of 1 hour (2%)
Practical classes	9 sessions of 4 hours (24%)
Supervised practical classes	9 sessions of 2 hours (12%)
Private study	84 hours (56%)
Total	150 hours

Private study description

84 hours of guided independent learning

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A6

	Weighting	Study time
Term 1 Design Portfolio	30%	
Term 1 Design Portfolio (30%) 13 A4 pages (or A3 equivalent)		
Term 2 Sprint 1 Group Report	35%	
Term 2 Sprint 1 Group Report (35%) Maximum of 15 sides of A4 and a 5 minute group video presentation. Including peer assessment.		
Term 3 Sprint 2 Group Report	35%	
Term 3 Sprint 2 Group Report (35%) Maximum of 15 sides of A4 and a 5 minute group video presentation. Including peer assessment.		

Feedback on assessment

- Verbal feedback during design seminars.
- Support through advice and feedback hours.
- Verbal and written feedback on design reports.

Availability

Courses

This module is Core for:

- Year 1 of UESA-H335 BEng Automotive Engineering
- Year 1 of UESA-H161 BEng Biomedical Systems Engineering
- Year 1 of UESA-H216 BEng Civil Engineering
- Year 1 of UESA-H63W BEng Electronic Engineering
- Year 1 of UESA-H113 BEng Engineering
- Year 1 of UESA-HN15 BEng Engineering Business Management
- Year 1 of UESA-HH75 BEng Manufacturing and Mechanical Engineering
- Year 1 of UESA-H315 BEng Mechanical Engineering
- Year 1 of UESA-HH35 BEng Systems Engineering
- UESA-H112 BSc Engineering
    - Year 1 of H112 Engineering
    - Year 1 of H112 Engineering

- Year 1 of UESA-HN11 BSc Engineering and Business Studies
- Year 1 of UESA-H336 MEng Automotive Engineering
- Year 1 of UESA-H163 MEng Biomedical Systems Engineering
- Year 1 of UESA-H217 MEng Civil Engineering
- Year 1 of UESA-H63X MEng Electronic Engineering
- Year 1 of UESA-H114 MEng Engineering
- Year 1 of UESA-HH76 MEng Manufacturing and Mechanical Engineering
- Year 1 of UESA-H316 MEng Mechanical Engineering
- UESA-HH31 MEng Systems Engineering
    - Year 1 of HH31 Systems Engineering
    - Year 1 of HH35 Systems Engineering
- Year 1 of UESA-H605 Undergraduate Electrical and Electronic Engineering
- Year 1 of UESA-H606 Undergraduate Electrical and Electronic Engineering MEng