WM290-15 Product Design for Manufacturing and Assembly

26/27

Department
WMG
Level
Undergraduate Level 2
Module leader
Neill Raath
Credit value
15
Module duration
14 weeks
Assessment
100% coursework
Study locations
University of Warwick main campus, Coventry Primary
Distance or Online Delivery

Description

Introductory description

This 15 CATS module, running at the start of year 3 of study gives learners the opportunity to apply academic knowledge to a practical problem of product re-design and forms an introduction to the 30CATS module running throughout year 3 of the Degree.

First part of the module focuses on learner's ability to appraise the product's ease of assembly and modify component features generating inefficiencies while working as part of a group. Appraisal of the product's ease of manufacture that includes analysing benefits and drawbacks of different manufacturing techniques and their limitations forms the basis of the second assessment in the form of an individual report.

This module is linked with C2, C3, C5, C7, C13, C17 of the AHEP 4.
LO1- C2,C5
LO2- C7
LO3- C3,C7
LO4- C5,C13
LO5- C17
LO5-C16

Module web page

Module aims

The main aim of the module is to provide context for knowledge and skills gained throughout the first 2 years of study. Additionally through highlighting the inter-module links Design for Manufacturing and Assembly develops the student's awareness of multiple facets of engineering projects.

Through DFMA product analysis students gain perspective on importance of aspects such as:
-design efficiency quantification
-material properties
-performance based material selection

- manufacturing process selection
  -manufacturing process limitations and design considerations
- customer buying priorities
- business and financial impact of design projects

The ability to assess design efficiency via the means of qualitative and quantitative measures is the initial aim of this module. Assessing the impact of design chances on the manufacturing process hence the overall profit margins and financial viability of the product redesign form the second module aim.

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. Introduction: definition, overview of DFMA process.
2. Design for Assembly design considerations.
3. Method of assembly: flexible manufacturing systems and robots, component that assist and/or prevent economic manufacture using automatic assembly methods.
4. Design for Manufacture design considerations.
5. Process selection, number of process stages, flexibility of processes, optimise the process and material requirements, standardisation, total cost and impact of the DFMA.

Learning outcomes

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

- Analyse product design efficiency and techniques that facilitate economic assembly with no detrimental effect on product's perceived quality [AHEP:4-C2,C5].
- Select an appropriate material for a component based on user and business needs while accounting for the environmental and societal impact of choices made [AHEP:4-C7].
- Evaluate factors and limitations associated with manufacturing processes and select an appropriate process for implementation in chosen product manufacture [AHEP:4-C3,C7].
- Evaluate design solutions to facilitate quality inspection [AHEP:4-C5,C13].

- Communicate the overall findings of the process to a technical audience [AHEP:4-C17].
- Function effectively as an individual, and as a member or leader of a team [AHEP:4- C16].

Indicative reading list

Reading lists can be found in Talis

Specific reading list for the module

Subject specific skills

1. Translate conceptual ideas or technical requirements into developmental outcomes or operational designs or specifications for products, systems or components to solve manufacturing challenges such as compliance, technology, technical or physical challenges.(S1 in ST0025, S1 in ST0027)
2. Select, use and apply approved problem-solving methods to solve complex problems and determine appropriate solutions or actions such as Define, Measure, Analyse, Improve, and Control (DMAIC), Failure Mode Effects Analysis (FMEA) or Plan-Do-Check-Act (PDCA) (S2 in ST0025, S2 in ST0027)
3. Observe, record and draw accurate and auditable conclusions from data and/or developmental or test evidence. (S5 in ST0025, S5 in ST0027)
4. Demonstrate leadership when undertaking product design, development, modification or update engineering activities. (S10 in ST0027)
5. Lead manufacturing engineering activities. (S11in ST0025)
6. Evaluate engineering designs, development or modification options. (S13 in ST0027)

Transferable skills

Understanding of business, government and third sector issues and priorities.
-Understanding organisational norms of behaviour.
-The systematic collection, analysis and evaluation of information in the investigation of a topic.
-Manages priorities and time.
-Aware of personal strengths and emotional intelligence.
-Reflect on learning, seeking feedback on and evaluating personal practices, strengths and opportunities for personal growth.
-Verbal communication: Communicate orally in a clear and sensitive manner which is appropriately varied according to different audiences.
-Written communication: Present arguments, knowledge and ideas, in a range of formats

- Use rational and logical reasoning to deduce appropriate and well-reasoned conclusions.
  -Operate within, and contribute to, a respectful, supportive and cooperative group climate.

Study

Study time

Type	Required
Lectures	10 sessions of 1 hour (7%)
Seminars	8 sessions of 1 hour (5%)
Practical classes	3 sessions of 1 hour (2%)
Online learning (scheduled sessions)	9 sessions of 1 hour (6%)
Online learning (independent)	5 sessions of 1 hour (3%)
Other activity	5 hours (3%)
Private study	50 hours (33%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Additional questions on the subject matter.

Online forum and discussion (asynchronous).

Other activity description

Online support / consultancy for the assignments

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

Assessment component	Weighting	Study time	Eligible for self-certification
Assignment 1	40%	24 hours	No

Group Report on Design for Assembly of an assembly of a product.
Typical group will consist of 6, possibly 5 students. Peer-marking will be applied in accordance

	Weighting	Study time	Eligible for self-certification

with WMG policy.
Students will choose a real world product (consisting of 15-25 unique parts) and carry out a detailed analysis of its Design for Assembly using the Boothroyd process.

Reassessment component

Assessment 1 re-assessment			No

Individual Report. This applies only if 1 or a few students from the group do not engage in the first part of the term due to medical or personal reasons.
If they have to do re-assessment after term 1 of year 3, they might be combined with similar students from other groups into a new group and re-submit the original group work.

If non the above applies it will individual re-assessment as follows:

Individual report DFA analysis of a predefined assembly that is less complex (fewer parts, fewer materials used, fewer manufacturing processes involved) than the original assignment requirements.

Assessment component

Assignment 2	60%	36 hours	Yes (extension)

Individual Report on DFM analysis of the DFA re-designed product.

Reassessment component

Assignment 2			No

Individual Report on DFM analysis of the DFA re-designed product.

Feedback on assessment

Formative cohort level feedback on the product choice for Design for Assembly assessment 1 draft.
Formative verbal feedback during tutorial sessions on report progress.

Summative, written group feedback on written reports-Assignment 1.
Summative, written individual feedback- Assignment 2

Availability

Courses

This module is Core for:

- Year 3 of UWMS-H7C1 Undergraduate Applied Professional Engineering (Manufacturing Engineer)
- Year 3 of DWMS-H7C5 Undergraduate Applied Professional Engineering (Manufacturing Engineer) (Degree Apprenticeship)
- Year 3 of UWMS-H7C4 Undergraduate Applied Professional Engineering (Product Design and Development Engineer)
- Year 3 of DWMS-H7C8 Undergraduate Applied Professional Engineering (Product Design and Development Engineer) (Degree Apprenticeship)