

WM296-15 Computer-aided Engineering for Mechatronic Systems

27/28

Department

WMG

Level

Undergraduate Level 2

Module leader

Rob Thornton

Credit value

15

Module duration

10 weeks

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

Computer-Aided Engineering (CAE) plays a crucial role in robotics, enabling engineers to design, analyse, and optimise mechatronic systems. It uses computational methods to design mechatronic systems and ensure optimal functionality and performance.

By integrating CAE into mechatronic design, engineers can streamline development, improve performance, ensure reliability, and significantly reduce costs and time to market.

Module aims

The module makes use of Model-Based Systems Engineering (MBSE) and multiphysics approaches to design and simulate mechatronic systems. Use of industry-relevant CAE software packages for design and simulation of mechatronic systems is a key part of this module.

Learners will develop knowledge and skill in CAE methodologies for modelling, simulation and analysis. They will be able to explore the applications of CAE in mechatronics and engineering to optimise designs and predict system performance using computational methods.

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.

Applications of Model-Based Systems Engineering (MBSE) and multiphysics:

- Overview of concepts and methodologies
- Introduction to Systems Modelling Language (SysML)
- Introduction to Finite Element Analysis (FEA).

Modelling mechatronic systems using CAE:

- Creating models using CAE software.
- Incorporating kinematics and vibrations.
- Designing, running and post-processing CAE simulations.

Learning outcomes

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

- Describe typical applications of Systems Modelling Language (SysML) and finite element analysis (FEA) in the design of mechatronic systems [AHEP:4-C1, C2, C4].
- Apply SysML and FEA in the modelling of mechatronic systems using industry-relevant CAE software [AHEP:4-C3].
- Simulate the kinematics, vibration and control of mechatronic systems using industry-relevant CAE software [AHEP:4-C1,C3,].
- Post process and interpret simulations results to derive meaningful performance information and recommend systems design improvements [AHEP:4-C5] .

Indicative reading list

[Reading lists can be found in Talis](#)

Subject specific skills

Systems Modelling Language (SysML)

Finite Element Analysis (FEA).

Use of SysML and FEA computer-aided engineering tools.

Transferable skills

This module will contribute to the development of the following from the Warwick Core Skills framework:

Critical Thinking: Interpreting, analysing

Problem Solving: Problem creation

Teamworking: Collaboration

Study

Study time

Type	Required
Lectures	12 sessions of 1 hour (8%)
Seminars	12 sessions of 1 hour (8%)
Practical classes	6 sessions of 1 hour (4%)
Online learning (independent)	30 sessions of 1 hour (20%)
Private study	30 hours (20%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Online learning (independent): Engagement with provided study materials and signposted resources - review, interpretation and application to example problems and case studies.

Private study: Creation of own tools and resources - e.g. theoretical / physical models, computational simulations, digital design artefacts, portfolio evidence etc. relevant to subject.

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
Assessment 1	30%	18 hours	No

	Weighting	Study time	Eligible for self-certification
Deliver an individual presentation covering the application, benefits and limitations of MBSE and FEA to a self-selected engineering case study.			

Reassessment component

Assessment 1 reassessment			No
Record an individual presentation covering the application, benefits and limitations of MBSE and FEA to a self-selected engineering case study.			

Assessment component

Assessment 2	70%	42 hours	No
Group portfolio describing the simulation and proposed improvements to a mechatronic system using industry-relevant CAE software. Subject to peer marking in line with WMG policy.			

Reassessment component

Assessment 2 reassessment			No
Individual portfolio describing the simulation and proposed improvements to a mechatronic system using industry-relevant CAE software.			

Feedback on assessment

Formative: Verbal feedback during interactive class sessions; Verbal feedback during ad hoc meetings; Verbal feedback following presentations.

Summative: Written feedback and marks aligned with University 20 point marking scale.

Availability

There is currently no information about the courses for which this module is core or optional.