

# WM9C9-15 Material Properties and Selection Criteria

**24/25**

**Department**

WMG

**Level**

Taught Postgraduate Level

**Module leader**

Neill Raath

**Credit value**

15

**Module duration**

5 days

**Assessment**

100% coursework

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

Modern automotive manufacturing embraces a multi-material approach to achieve strong, lightweight structures to help reduce tailpipe emissions. This module will give students the tools required for scientific material selection. The module provides comprehensive knowledge of metallic and polymeric materials used in automotive manufacturing. The environmental and cost implications of selecting certain materials will be considered, including areas of end-of-life, manufacturing processes and use/repair.

### Module aims

To provide comprehensive knowledge of the key, and state-of-the-art, metallic and polymeric materials used in automotive manufacture, their properties and applications.

To introduce a scientific approach to material selection through use of appropriate material selection methods, reinforced through practical case studies.

To understand the implications on cost from a materials level, associated manufacturing processes, use (including repair) and end-of-life.

### 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.

- Properties of metallic materials
- Properties of polymers and polymeric composites
- Case studies: Foams, Load space & Tailgate
- Joining
- Materials selection methods
- Material selection processes for interiors
- Practical application of material selection tools

## **Learning outcomes**

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

- Evaluate the suitability of new materials and process for automotive applications, in terms of manufacturability, material properties, cost and environmental impact.
- Evaluate the benefits of a new material, leading to the creation of an advanced component/architectural concept which gives a cost of weight saving suitable for the target vehicle's performance, packaging and structural requirements.
- Interpret supplier and laboratory data to make informed decisions regarding the application of materials.
- Design of conceptual automotive solution by applying systematic material and process selection applications exhibited through practical experience of material selection and life cycle analysis software.
- Interpret the ethical choices associated with material choices for interior sections.

## **Indicative reading list**

Materials and the environment : eco-informed material choice, M.F. Ashby. Butterworth-Heinemann, 2012. ISBN: 9780123859716

Multi-criteria decision analysis for supporting the selection of engineering materials in product design, A. Jahan, K.L. Edwards, M. Bahraminasab. Butterworth-Heinemann, 2016. ISBN: 9780081005415

Advanced applications in manufacturing engineering, M. Ram, J. Paulo Davim. Woodhead Publishing, 2019. ISBN: 9780081024157

Eco-factories of the future, S. Thiede and C. Herrmann. Springer, 2019. ISBN: 9783319937304

[View reading list on Talis Aspire](#)

## **Subject specific skills**

The module will develop the following subject specific skills: Scientific Material Selection practice, Appraisal and critique of engineering, processing and cost implications of a material change, Appraisal of environmental impact of a material change.

## Transferable skills

Collaborative working, Critical thinking and analysis, Academic writing skills

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## Study

### Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Seminars	3 sessions of 1 hour (2%)
Tutorials	2 sessions of 1 hour (1%)
Supervised practical classes	5 sessions of 1 hour (3%)
Online learning (independent)	60 sessions of 1 hour (40%)
Assessment	60 hours (40%)
Total	150 hours

### Private study description

No private study requirements defined for this module.

### Costs

No further costs have been identified for this module.

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## Assessment

You do not need to pass all assessment components to pass the module.

### Assessment group A1

	Weighting	Study time
Post Module Assessment	80%	48 hours
A written report showing a methodological and scientific material selection process for a specific automotive component, whereby functional requirements are considered as well as manufacturability, production volumes, investment, cost and environmental impact.		
In-module Assessment	20%	12 hours
Critical evaluation, and practical application of, material selection techniques in an automotive context		

## **Feedback on assessment**

In-class debrief of performance on in-module activity. Written feedback, of approximately 300 - 400 words, will be provided 4 weeks after the date of submission of the PMA. The feedback will be focussed on the strengths and weaknesses of the work with regards to the module learning objectives and the post module assessment marking guidelines. Suggestions for improvement will also be provided.

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## **Availability**

### **Courses**

This module is Core for:

- EWMS-H1U3 Postgraduate Taught Engineering Competence (Sustainable Automotive Materials Engineering) (Degree Apprenticeship)
  - Year 1 of H1U3 Engineering Competence (Sustainable Automotive Materials Engineering) (PGDip) (DA)
  - Year 1 of H1AB Sustainable Automotive Materials Engineering
- Year 1 of TWMS-H1AB Postgraduate Taught Sustainable Automotive Materials Engineering