

# ES4E6-15 Automotive Materials and Processes

**22/23**

**Department**

School of Engineering

**Level**

Undergraduate Level 4

**Module leader**

Michael Auinger

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

100% coursework

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

ES4E6-15 Automotive Materials and Processes

[Module web page](#)

### Module aims

This automotive related module advances the known key aspects of materials selection for body-in-white parts as well as for view parts and powertrain application. A range of selected processes to manufacture and combine different materials will be evaluated, according to their suitability for automotive manufacture and in order to improve performance of the vehicle in terms of mechanical strength, weight reduction, overall costs and environmental impact. Highly specialised parts such as coatings, catalysts and brakes will also be introduced to the audience.

### 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.

Lightweight materials: High strength steels, Aluminium and Magnesium Alloys, Plastics and Composites

Processes: Pressing and Forming, Joining, Composite manufacture

Specialist applications: Coatings, Catalysts and Brakes

Design for light-weighting

## **Learning outcomes**

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

- Demonstrate an advanced understanding and evaluate the production processes of metallic materials, used for automotive fabrication.
- Demonstrate advanced knowledge on where to use certain materials in the chassis, for panels and powertrain application as well as applying this to evaluate reasonable design of a “real” vehicle in the coursework.
- Evaluate current techniques for joining the different materials, mentioned above and apply this knowledge to the design of a “real” vehicle in the coursework.
- Assess the importance of the use of different materials in terms of mechanical stability, lightweight application, environmental impact and costs. Advance this knowledge to the complex design in automotive applications.

## **Indicative reading list**

- Chang-Soo Kim, Charles Randow, Tomoko Sano “Hybrid and Hierarchical Composite Materials” Springer International Publishing (2015).
- Vadim V. Silberschmidt, Valery P. Matveenko “Mechanics of Advanced Materials – Analysis of Properties and Performance” Springer International Publishing (2015).
- Jörg Vetter “Chapter - Surface Treatments for Automotive Applications” from “Coating Technology for Vehicle Applications” Springer International Publishing (2015).
- Andre Hieke, Val. Lieberman, G.J. van der Kolk “Chapter – Hard Coatings and Coating Processes for the Automotive Industry” from “Coating Technology for Vehicle Applications” Springer International Publishing (2015).

## **Subject specific skills**

Ability to conceive, make and realise a component, product, system or process

Ability to be pragmatic, taking a systematic approach and the logical and practical steps necessary for, often complex, concepts to become reality

Ability to seek to achieve sustainable solutions to problems and have strategies for being creative and innovative

## **Transferable skills**

Apply problem solving skills, information retrieval, and the effective use of general IT facilities

Communicate (written and oral; to technical and non-technical audiences) and work with others

Exercise initiative and personal responsibility, including time management, which may be as a team member or leader

Appreciation of the global dimensions of engineering, commerce and communication  
Be professional in their outlook, be capable of team working, be effective communicators, and be able to exercise responsibility and sound management approaches.

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## Study

### Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Project supervision	1 session of 3 hours (2%)
Other activity	1 hour (1%)
Private study	116 hours (77%)
Total	150 hours

### Private study description

116 hrs guided independent learning

### Other activity description

1 x 1 hr revision class

(1 x 3 hr hands-on session where people can have a look to the vehicles that are shown either in a workshop or at Warwick to evaluate and interpret which materials are appropriate and are being used and where they are used.)

## Costs

No further costs have been identified for this module.

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## Assessment

You must pass all assessment components to pass the module.

### Assessment group A1

	Weighting	Study time
Workshop based report	40%	
Group Workshop-based Report (3000 words)		
Assignment	60%	

6 pages

### **Feedback on assessment**

- Model solutions to past papers.
  - Support through advice and feedback hours.
  - Written feedback on assignment.
  - Cohort-level feedback on final exam.
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### **Availability**

#### **Courses**

This module is Core for:

- Year 4 of UESA-H336 MEng Automotive Engineering

This module is Optional for:

- Year 4 of UESA-H116 MEng Engineering with Exchange Year
- Year 5 of UESA-H115 MEng Engineering with Intercalated Year

This module is Option list A for:

- Year 5 of UESA-H337 MEng Automotive Engineering with Intercalated Year
- Year 4 of UESA-H114 MEng Engineering
- Year 4 of UESA-HH76 MEng Manufacturing and Mechanical Engineering
- Year 5 of UESA-HH38 MEng Manufacturing and Mechanical Engineering with Intercalated Year
- Year 5 of UESA-HH77 MEng Manufacturing and Mechanical Engineering with Intercalated Year