

# WM9D2-15 Automotive Joining

**21/22**

**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

This module covers the technical and environmental challenges faced by automotive manufacturers, both currently and in the future. Students will gain an advanced understanding of the three major types of joining (fusion, mechanical and adhesive) and the technical considerations required for successful application of each. Emphasis is also placed on the environmental impacts and considerations for automotive joining, particularly recycling issues. Technical considerations such as structural vs aesthetic joints, multi-material joining and comparison of mechanical properties of joining types.

### Module aims

To provide an advanced understanding of the issues related to multi-material automotive joining, as well as similar material joining.

To provide a comprehensive understanding of the implementation steps to introduce a new joining process into manufacturing industry, including: initial business case, technology definition, specific application requirements and business benefits and risks.

To provide an advanced understanding of environmental considerations and costs associated with automotive joining.

### 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.

- Mechanical properties of SPR vs RSW vs Laser welds
- Joining for premium sector (aesthetics)
- Structural vs aesthetic joints
- SPR manufacturing considerations: validation time required for design tweaks & NDT for SPR
- Fusion joining (laser welding, RSW)
- Adhesive joining
- Mechanical joining (bolts, SPR, RIVTAC)
- Joining for multi-material structures
- Recycling issues related to joining
- Lab-based practical sessions (when circumstances allow)

## **Learning outcomes**

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

- Evaluate different joining technologies and interpret how they are differentiated by: Fundamental performance, Strength & fatigue, Manufacturing considerations (cycle time), Use, Safety, Cost, Repair.
- Critique the range of attributes that influence the successful application of new joining technology, including cost drivers and constraining factors for new model introduction.
- Appraise and critique the environmental impact of joining decisions.
- Interpret current and future joining challenges.
- Conceptualise the potential application of new manufacturing techniques and critique its application, and creatively overcoming issues identified.
- Prepare a systematic and practical proposal to introduce a new advanced technology process, which extends the current manufacturing capabilities and justify choices made

## **Indicative reading list**

Joining of polymer-metal hybrid structures : principles and applications, S.T. Amancio-Filho and L.A. Blaga. John Wiley & Sons, 2018. ISBN: 9781119429807

Automotive steels : design, metallurgy, processing and applications, R. Rana and S.B. Singh. Woodhead Publishing, 2017. ISBN: 9780081006535

Joining of polymer-metal hybrid structures : principles and applications, S.T. Amancio-Filho and L.A. Blaga. John Wiley & Sons, 2018. ISBN: 9781119429807

The automotive body manufacturing systems and processes, M.A. Omar. Wiley, 2011. ISBN: 9781119990888

## **Subject specific skills**

Appraisal and critique of joining methods, Implementing a change of joining method practice, Cost and environmental impact analysis of joining.

## Transferable skills

Collaborative working, Critical thinking and analysis, Academic writing skills

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## Study

### Study time

Type	Required
Lectures	25 sessions of 1 hour (17%)
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)	20 sessions of 1 hour (13%)
Assessment	95 hours (63%)
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 A

	Weighting	Study time
Post Module Assessment	80%	90 hours
A written report investigating the environmental and manufacturing effects of implementing an optimal joining method for a selected automotive component/system. This report will consider areas such as joint strength, multi-material joining, recycling issues, joint aesthetics and process time.		
In-module Assessment	20%	5 hours
Critical evaluation of environmental and manufacturing effects of implementing optimal joining		

## **Weighting**

## **Study time**

solutions in an automotive context.

### **Feedback on assessment**

Written feedback, of approximately 300 - 400 words, will be provided 4 weeks after the date of submission. 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**

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