

## Module Specification

### Module Summary Information

<b>1</b>	<b>Module Title</b>	Body and Chassis Performance
<b>2</b>	<b>Module Credits</b>	20
<b>3</b>	<b>Module Level</b>	6
<b>4</b>	<b>Module Code</b>	ENG6077

<b>5</b>	<b>Module Overview</b>
<p>Automobile design is experiencing a period of dynamic change. Alternative power-trains, fuels, materials, safety needs, and consumer demands for increased refinement will have a profound effect upon body architecture. The emphasis for this module will be on gaining insight into auto body structural behaviour and the relationship to the vehicle.</p> <p>Body structure element behaviour will be examined including thin walled members, panels, joints, spot welds, and local attachments.</p> <p>Structural models for the primary requirements will be analysed in detail. These include global body bending, body torsion, crash-worthiness, and vibration behaviour.</p> <p>The importance of bending and torsion stiffness on the perceived level of refinement will be discussed, and tools for analysis will be developed.</p> <p>The interaction between structural topology and vehicle packaging and styling will be treated, including the need for trade-off analysis in configuration. Methods for selection of alternative body materials will be covered.</p>	

<b>6</b>	<b>Indicative Content</b>
<ul style="list-style-type: none"> <li>• Mass balancing of vehicles, vehicle packaging, design of different vehicle structures for requirement</li> <li>• Stresses and deformation of vehicle body structures and load path analysis, design and analysis of shear panels, buckling of beam structures of thin thickness</li> <li>• Strengthening and optimisation of vehicle structures, joint design and influence on vehicle stiffness</li> <li>• Joining techniques of structural vehicle components</li> <li>• Review mechanics of materials knowledge.</li> <li>• Customer description and package following template.</li> <li>• Estimate structure mass and mass distribution.</li> <li>• Work out handling balance of the proposed vehicle</li> <li>• Work out vehicle ride dynamics and body modes</li> <li>• Research common vehicle body structures.</li> <li>• Interpret customer needs to create a flow down of requirements.</li> <li>• Mass compounding.</li> <li>• Package drawing following templates.</li> </ul>	

- Virtual visit a vehicle body in white manufacturing plant
- Structural load paths in vehicles: Simple Structural Surfaces (SSS) method.
- Make and use 3D physical models to study load paths in vehicles.
- Attempt to apply the SSS method to a vehicle body. Examine published SSS solutions.
- Design of shear panels and frames. Design for bending and torsion.
- Outline alternatives for car data bus networking.
- Investigate buckling phenomena
- Design of beams with thin-walled sections. Section design and sizes.
- Optimise a thin walled beam application for strength and stiffness.
- Identify examples of attachment points at a local vehicle end of life reprocessing centre.
- Local attachment - locate and secure suspension components.
- Virtual test attachment points in tensile test machine.
- Virtual visit a local vehicle end of life reprocessing centre.
- Masterclass on local attachment of suspension.
- Body chassis network architectures and data networking.
- Identify examples of joints
- Joint design - stiffness.
- Build 3D physical model of T joint
- Apply SSS method to T joint.
- Masterclass on joint design.
- Observe test of Ford T joint

7	<b>Module Learning Outcomes</b>	
	<b>On successful completion of the module, students will be able to:</b>	
	<b>1</b>	Interpret, analyse and evaluate the requirements of the customer with respect to structural needs.
	<b>2</b>	Evaluate and adjust the vehicle mass using mass compounding.
	<b>3</b>	Determine numerical structural requirements.
	<b>4</b>	Apply first order models to size a body structure for a specific vehicle to check body bending, torsion, crash-worthiness, and thin-wall section sizing.

8	<b>Module Assessment</b>		
Learning Outcome			
	Coursework	Exam	In-Person
1-4	100%		

<b>9 Breakdown Learning and Teaching Activities</b>	
<b>Learning Activities</b>	<b>Hours</b>
<b>Scheduled Learning (SL)</b> includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable	45
<b>Directed Learning (DL)</b> includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE	3
<b>Private Study (PS)</b> includes preparation for exams	152
<b>Total Study Hours:</b>	200