

## MODULE DESCRIPTOR

### Module Title

Electric and Hybrid Vehicles

Reference	EN4201	Version	1
Created	September 2023	SCQF Level	SCQF 10
Approved	February 2024	SCQF Points	15
Amended		ECTS Points	7.5

### Aims of Module

To develop knowledge of concepts, working principles and operating performance of different types of electric and hybrid vehicles.

### Learning Outcomes for Module

On completion of this module, students are expected to be able to:

- 1 Examine the types of electric and hybrid vehicles and their working principles.
- 2 Critique the operating performance, safety and application of different propulsion systems in electric and hybrid vehicles and their respective drivetrain systems.
- 3 Examine the future challenges on the design and development of electric and hybrid vehicles.
- 4 Critique the feasibility of the alternatives of carbon-free vehicles.

### Indicative Module Content

Indicative module content of this module includes the classification of different types of electric and hybrid vehicles towards their differences in working principles of the propulsion systems, e.g., hybrid electric vehicle, all-electric vehicle, plug-in hybrid vehicle, hydrogen vehicle, etc... The module will also cover their operating performance, suitability as well and the safety of the use of different propulsion systems and the respective drivetrain components in their power transmission. Limitations and future challenges of the current systems towards low emission will also be discussed. The alternative of using carbon-free fuel such as hydrogen and ammonia in internal combustion engines shall also be included.

### Module Delivery

The module is delivered by means of lectures, tutorials, and guided self-study.

**Indicative Student Workload**

	Full Time	Part Time
Contact Hours	35	35
Non-Contact Hours	115	115
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	150
<i>Actual Placement hours for professional, statutory or regulatory body</i>		

**ASSESSMENT PLAN**

If a major/minor model is used and box is ticked, % weightings below are indicative only.

**Component 1**

Type:	Coursework	Weighting:	100%	Outcomes Assessed:	1, 2, 3, 4
Description:	The coursework consists of a group project in the form of a written report based on case studies on different types of electric and hybrid vehicles.				

**MODULE PERFORMANCE DESCRIPTOR****Explanatory Text**

Component 1 comprises of 100% of the module grade. To pass the module, a D grade is required.

Module Grade	Minimum Requirements to achieve Module Grade:
<b>A</b>	A
<b>B</b>	B
<b>C</b>	C
<b>D</b>	D
<b>E</b>	E
<b>F</b>	F
<b>NS</b>	Non-submission of work by published deadline or non-attendance for examination

**Module Requirements**

Prerequisites for Module	EN3200
Corequisites for module	None.
Precluded Modules	None.

**INDICATIVE BIBLIOGRAPHY**

- |   |  |
|---|--|
| 1 | Husain, I. (2021). Electric and Hybrid Vehicles. 3rd edition. Taylor & Francis.  |
| 2 | Hu, H. (2021). Advanced Hybrid Powertrains for Commercial Vehicles. SAE International. ISBN: 9781523140534   |
| 3 | Patel, N., Bhoi, A. K., Sanjeevikumar, P., and Holm-Nielsen, J. B. (2021). Electric Vehicles: Modern Technologies and Trends. Springer. ISBN: 9789811592515                                    |
| 4 | Van de Voorde, M. (2021). Utilization of Hydrogen for Sustainable Energy and Fuels, Volume III - Hydrogen: Presents Accomplishments and Far-Reaching Promises. De Gruyter. ISBN: 9783110596274 |
| 5 | Ottorino, V. (2017). Technologies and Applications for Smart Charging of Electric and Plug-in Hybrid Vehicles. Springer. ISBN: 9783319436517   |
| 6 | Chau, K. T. (2016). Energy Systems for Electric and Hybrid Vehicles. Institution of Engineering and Technology (The IET). ISBN: 9781785610097  |
| 7 | Miller, J.M. (2010). Propulsion Systems for Hybrid Vehicles. Institution of Engineering and Technology (The IET). ISBN: 9781613444122  |