

Module Information

2022.01, Approved

Summary Information

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| Module Code | 5505ICBTAE |
| Formal Module Title | Hybrid and Electrical Vehicle Technology |
| Owning School | Engineering |
| Career | Undergraduate |
| Credits | 15 |
| Academic level | FHEQ Level 5 |
| Grading Schema | 40 |

Teaching Responsibility

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|-----------------------------------|
| LJMU Schools involved in Delivery |
| LJMU Partner Taught |

Partner Teaching Institution

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| Institution Name |
| International College of Business and Technology |

Learning Methods

| Learning Method Type | Hours |
|----------------------|-------|
| Lecture | 45 |
| Practical | 12 |
| Seminar | 6 |
| Tutorial | 15 |
| Workshop | 6 |

Module Offering(s)

| Display Name | Location | Start Month | Duration Number Duration Unit |
|--------------|----------|-------------------------------------|-------------------------------|
| APR-PAR | PAR | April | 12 Weeks |
| JAN-PAR | PAR | January | 12 Weeks |
| SEP_NS-PAR | PAR | September (Non-standard start date) | 12 Weeks |

Aims and Outcomes

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| Aims | This unit addresses the theoretical aspects on the novel concepts in automotive engineering including electric drive systems and hybrid systems. As the main part of the unit, the design aspects, construction and operating principles are included. In addition, the efficiency, environmental concerns and other advantages of electric and hybrid systems and integrated into the content. Knowledge on different types of hybrid systems such as series, parallel and series-parallel as well as full electric vehicles and plug in hybrid systems are expected to be delivered. |
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After completing the module the student should be able to:

Learning Outcomes

| Code | Number | Description |
|------|--------|---|
| MLO1 | 1 | Explain the operational deficiencies of traditional IC engines such as fuel efficiency, wastage of energy environmental pollution and describe the need of electric and hybrid drivetrains. |
| MLO2 | 2 | Appraise the operational principles of hybrid drivetrains and compare with traditional IC engines and electric drivetrains. |
| MLO3 | 3 | Illustrate the risks and hazards associated with electric and hybrid drivetrains and recommend safety precautions needed in operation and maintenance. |
| MLO4 | 4 | Define performance characteristics applicable for hybrid and electric drivetrains and carry out vehicle performance tests. |

Module Content

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|------------------------|---|
| Outline Syllabus | IntroductionEnergy economy of traditional engines, analysis of energy wastage, environmental and other concerns, the need of energy efficient and environmentally friendly vehiclesIntroduction to electric systemsTypes of electric drive trains, motor specifications, power sources, types of batteries, fuel cells, control and charging systems, efficiency and environmental benefits, torque transmission elements (mechanical transmissions and other components);Definition of hybrid drives. Introduction to the concept of energy accumulation and energy recovery, regenerative braking properties, efficiency of electric systemsElectric and hybrid car architectures. Various Hybrid electric vehicles (HEV) configurations and their operation modes, Electric machine torque transmission to vehicle's tractions wheel, mechanical and electrical differential.Selection of electric vehicle components parameters.Power of electric machine, torque, electrochemical battery size, gear ratios selection and quantify in terms of the criterion of the highest efficiency and lowest weightEvaluation of electric/hybrid propulsion system in terms of power train architecture.Electric vehicle movement characteristics, cornering movement of electric vehicle, maintenance of HEV and hazards, current international economic and environmental policy on alternative vehicles development and market launch.Advancements of Energy Efficient VehiclesImprovements of energy recovery and efficiency, integration with different energy sources; for example, solar energy, recovery of non-mechanical energy for enhanced efficiency |
| Module Overview | |
| Additional Information | |

Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Module Learning Outcome Mapping |
|---------------------|--------------------|--------|--------------------------|---------------------------------|
| Practice | Practical/Workshop | 30 | 0 | MLO3, MLO4 |
| Exam | Exam | 70 | 2 | MLO1, MLO2 |

Module Contacts

Module Leader

| Contact Name | Applies to all offerings | Offerings |
|--------------|--------------------------|-----------|
| Karl Jones | Yes | N/A |

Partner Module Team

| Contact Name | Applies to all offerings | Offerings |
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