The University Of Sheffield.

Electronic & Electrical Engineering.

EEE6021 ENERGY UTILISATION

Credits: 10

Course Description including Aims

1. To introduce fuel cell systems as a clean and efficient alternative energy source.
2. To provide a basic understanding of the principles of operation and characteristics of hydrogen fuel cell systems.
3. To discuss recent development and applications of fuel cell technology.
4. To introduce electric and hybrid drive-trains and their components.
5. To demonstrate the need for modelling and simulation in order to assess the benefits of a particular component and/or drive

Outline Syllabus

Fuel cell systems: Principles of operation, open circuit voltage and efficiency, fuel cell irreversibilities, operational characteristics, electrical dynamic behaviours, recent development and applications in electric and hybrid vehicles. **Electric Traction:** Electric and Hybrid drive-trains, modelling of drive-train components, vehicle kinematics, assessment of drive-train performance and efficiency, driving cycles and simulation.

Time Allocation

24 lectures plus 12 hours of additional support material.

Recommended Previous Courses

None.

Assessment

2 hour examination, answer 3 questions out of 4.

Recommended Books

J. Larminie & A. Dicks	*Fuel Cell Systems Explained*	John Wiley
G. Hoogers	*Fuel Cell Technology Handbook*	CRC Press, 2003
I. Husain	*Electric and hybrid vehicles*	CRC Press, 2003
M.H. Westbrook	*The electric car: development and future of battery, hybrid and fuel cell cars*	IEE, 2001

Objectives

By the end of the module a successful student will be able to

1. Describe the principles of operation, basic characteristics and recent development of hydrogen fuel cell systems.
2. Use appropriate techniques for modelling the fuel cell behaviour.
3. Discuss the potentials and limitations of fuel cell systems as electric energy source.
4. Explain the principles of electric and hybrid drive-train architectures and their components.
5. Model the components of electric and hybrid drive-trains.
6. Calculate the losses and efficiency of electric and hybrid drive-trains.
7. Calculate the performance of vehicles equipped with electric and hybrid drive-trains.