UWE Bristol University of the West of England

MODULE SPECIFICATION

Part 1: Information			
Module Title	Heat Transfer, Power and the Environment		
Module Code	UFMFW8-30-2	Level	Level 5
For implementation from	2018-19		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Faculty of Environment & Technology	Field	Engineering, Design and Mathematics
Department	FET Dept of Engin Design & Mathematics		
Contributes towards			
Module type:	Standard		
Pre-requisites	Energy and Thermodynamics 2018-19, Fluid Dynamics 2018-19		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

Educational Aims: See Learning Outcomes

Outline Syllabus: Power Generation:

Comprehensive review of energy generation methods and types of use. Critical appraisal of ideas relating to climate change, carbon reduction, embedded energy. Relationships between energy and finance. Project appraisal and life cycle costing.

The concept of Entropy and its relevance to work and heat transfer processes. Isentropic efficiency. Entropy change calculations for simple processes.

Use of isentropic efficiency and understanding of other losses to improve estimates of thermal efficiencies and other parameters relating to the performance of IC Engines, Gas turbines and Steam power plant.

Basic combustion chemistry. Use of empirical data to improve combustion system performance.

Compressible flows in nozzles and orifices. Compressible flows with friction in ducts – isothermal and adiabatic analysis.

Laboratory work on an IC Engine, Gas Turbine and Supersonic wind tunnel to support theoretical work above.

Heat Transfer:

Introduction to the basic mechanisms of heat transfer – conduction, convection and radiation.

Conduction for simple geometries. Numerical methods for complex geometries.

Forced convection. The boundary layer, concept of heat transfer coefficient, use of dimensional analysis in estimating heat transfer coefficients for standard geometries.

Natural convection. Use of empirical equations.

Design of heat exchangers. Surface area and outlet temperature calculations. Pressure losses.

Radiation. Significant parameters. Kirchoff's law. View factors – calculation and use of in black body radiation.

Extended surface.

Unsteady heat transfer.

Laboratory exercises to support the above.

Teaching and Learning Methods: Delivered over 2 semesters, both parts running concurrently.

Contact (lectures and laboratory): 72 hours
Assimilation and development of knowledge: 150 hours
Problem solving: 22 hours
Examination preparation: 56 hours
Total: 300 hours

Large group lecture. Study time outside of contact hours will be spent on going through exercises and example problems.

Lab sessions (small groups) will provide experience of empirical methods and will require further non-contact time or assignment preparation.

Scheduled learning: lectures and laboratory sessions
Independent learning: includes hours engaged with essential reading, assignment preparation and completion etc.

Part 3: Assessment
Component A: Power Generation and the Environment Assessed via end of semester Exam (2 hours, 45%) to assess the student's understanding of concepts and techniques. Laboratory work assessed by short reports completed during the scheduled sessions (5%). Component B: Heat Transfer Assessed via end of semester Exam (2 hours) to assess the student's understanding of concepts and techniques. Laboratory work assessed by short reports completed during the scheduled sessions.

First Sit Components	Final Assessment	Element weighting	Description
Report - Component B		5 %	Laboratory based assessment (heat) (short reports)
Report - Component A		5 %	Laboratory based assessment (power) (short reports)
Examination - Component B		45 %	End of semester exam (2 hours) (Heat)
Examination - Component A	✓	45 %	End of semester exam (2 hours) (Power)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Examination - Component B		50 %	Exam (2 hours) (Heat)
Examination - Component A	✓	50 %	Exam (2 hours) (Power)

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will be able to:

	Module Learning Outcomes
MO1	Knowledge of the principal methods of power generation and use
MO2	An appreciation of the relationships between sustainable development, energy production and use
MO3	Knowledge of the principal mechanisms of heat transfer and its application in the design of heat exchangers
MO4	Knowledge of the cost drivers, commercial constraints, uncertainty and risks in power generation and heat exchangers
MO5	Ability to acquire and analyse experimental data from laboratory and test cell experiments
MO6	Appreciation of health and safety aspects of working with power generating equipment

Contact Hours

Contact Hours	
Independent Study Hours:	
Independent study/self-guided study	228
Total Independent Study Hours:	228
Scheduled Learning and Teaching Hours:	
Face-to-face learning	72

	Total Scheduled Learning and Teaching Hours:	72
	Hours to be allocated	300
	Allocated Hours	300
Reading List	*The reading list for this module can be accessed via the following link:* https://uwe.rl.talis.com/modules/ufmfw8-30-2.html	