Module Specification

Heat Transfer, Power and the Environment

Version: 2021-22, v2.0, 16 Sep 2021

Contents

Part 1: Information

Module title: Heat Transfer, Power and the Environment

Module code: UFMFW8-30-2

Level: Level 5

For implementation from: 2021-22

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Delivery locations: Frenchay Campus, University Centre Somerset

Field: Engineering, Design and Mathematics

Module type: Standard

Pre-requisites: Fluid Dynamics 2021-22

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

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.

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.

Part 3: Teaching and learning methods

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.

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

Module Learning outcomes: On successful completion of this module students will achieve the following 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

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/ufmfw8-30-2.html

Part 4: Assessment

Assessment strategy: Component A: Power Generation and the Environment
Assessed via end of semester Exam (2.5 hours, 50%) to assess the student's understanding of concepts and techniques.

Component B: Heat Transfer
Assessed via end of semester Exam (2.5 hours, 50%) to assess the student's understanding of concepts and techniques.

Assessment components:

Examination - Component A (First Sit)
Description: End of semester exam (Power) (2.5 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO4

Examination - Component B (First Sit)
Description: End of semester exam (Heat) (2.5 hours)
Weighting: 50 %
Final assessment: No

Group work: No
Learning outcomes tested: MO3, MO4

Examination - Component A (Resit)
Description: Exam (Power) (2.5 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested:

Examination - Component B (Resit)
Description: Exam (Heat) (2.5 hours)
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mechanical Engineering [Sep][PT][Gloscoll][3yrs] FdSc 2019-20

Mechanical Engineering {Apprenticeship-UCW} [Sep][FT][UCW][3yrs] FdSc 2019-20

Mechanical Engineering {Apprenticeship-UCS} [Sep][FT][UCS][3yrs] FdSc 2019-20

Mechanical Engineering [Sep][PT][COBC][6yrs] BEng (Hons) 2018-19

Mechanical Engineering [Sep][PT][Frenchay][7yrs] MEng 2018-19

Mechanical Engineering [Sep][PT][Frenchay][6yrs] BEng (Hons) 2018-19