Module Proforma

Approved, 2022.01

Summary Information

Module Code	5517USST
Formal Module Title	Thermodynamics and Fluid Mechanics 2
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
Grading Schema	40

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Dante Matellini	Yes	N/A

Module Team Member

Contact Name	Applies to all offerings	Offerings

Partner Module Team

Contact Name	Applies to all offerings	Offerings

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
University of Shanghai For Science and Technology

Learning Methods

Learning Method Type	Hours
Lecture	22
Practical	6
Tutorial	22

Module Offering(s)

Offering Code	Location	Start Month	Duration
JAN-PAR	PAR	January	12 Weeks

Aims and Outcomes

Aims	To provide an insight into thermal plant cycles and the physical behaviour of fluid flow and heat transfer by application of the theory to practical engineering examples.

Learning Outcomes

After completing the module the student should be able to:

Code	Description
MLO1	Analyse thermal vapour plant cycles.
MLO2	Examine gas power plant cycles and combustion processes.
MLO3	Apply the governing equations for modes of heat transfer.
MLO4	Analyse flow in pipe networks and behaviour of compressible fluids.

Module Content

Outline Syllabus

The second law of thermodynamics and entropy.
Steam power plant, energy balances and cycle improvements.
T-S diagrams and entropy changes for gases, vapours and liquids.
Refrigeration, heat pumps, properties of refrigerants and operating cycles.

Gas turbines cycle analysis, methods of efficiency improvements and application to combined heat and power plant.
IC Engines: Spark/compression ignition, two/four stroke, operating cycles.
Stoichiometry: Combustion, exhaust emissions and associated pollution.

Modes of heat transfer: Conduction, convection and thermal radiation. Multimode/2D heat transfer.
Introduction to types of heat exchangers: Plate, compact, shell and tube.
Log mean temperature difference (LMTD) method of heat exchanger analysis.

Laminar and turbulent pipe flow, friction and minor losses in pipes and pipe networks.
Pumps and pump characteristic curves.
Descriptive treatment of real fluid flow.
1-d compressible flow. Mach no., isentropic flow, stagnation conditions, use of tables. Flow through nozzles.
Choked conditions. Critical pressure ratio.

Module Overview

Additional Information

This module continues the development of the fundamental ideas behind the development of core engineering disciplines of thermodynamics and fluid mechanics. Furthermore, students will be exposed to real engineering calculations and the performance analysis of thermal plants. The module is supported by tutorial work which will help develop the necessary understanding and skill required of an engineering student.

This module includes content which can be utilised in managing resources or developing new technologies that can potentially help to achieve the following UN sustainability goals:

SDG6 – Clean water and sanitation
SDG7 – Affordable and clean energy.
SDG9 – Industry, innovation and infrastructure
SDG12 – Responsible production and consumption

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Learning Outcome Mapping
Exam	Exam	70	2	MLO1, MLO2, MLO3, MLO4
Test	VLE Test	30	2	MLO1, MLO2, MLO3, MLO4