MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME101 HEAT AND FLOW 1

Module Registrar: Dr Konstantinos Zografos k.zografos@strath.ac.uk	**Taught To (Course): Mechanical, Electrical/Mechanical, Product Design and Man. Science**	
Other Lecturers Involved: Dr William Dempster	**Credit Weighting: 10**	**Semester: 1 and 2**
Compulsory class	**Academic Level: 1**	**Suitable for Exchange: N**

Required prerequisites

Note: It is the responsibility of ALL students to ensure that they satisfy the prerequisite knowledge for this module BEFORE adding as part of curriculum selection. If unsure, please contact the Module Registrar or discuss with your Programme/Year Adviser of Studies.

Mathematics and Physics at SQA Higher level or equivalent

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
	20				20		12	48	100

Educational Aim

Knowledge of Thermodynamics, Heat and Fluid Flow are important for the understanding and design of thermal and hydraulic systems involving energy conversion and transmission, such as engines and turbines, pumps and compressors, and associated pipework. The aim of the class is to introduce the basic concepts of Thermodynamics and Fluid Mechanics, and the applications thereof, as a foundation for further studies.

Learning Outcomes

On completion of the module the student is expected to be able to:

LO1 Understand the basic principles of conservation of energy, work and heat transfer for a closed system.

LO2 Apply the First law of Thermodynamics to a range of problems involving isothermal, adiabatic, polytropic, constant volume and constant pressure processes, all using a perfect gas. Use the steady flow energy equation for open systems.

LO3 Understand the basic principles of fluid flow, the continuity equation, and Bernoulli's Equation.

LO4 Apply the basic equations of fluid flow (continuity and Bernoulli) to problems involving pipe flow, nozzles and jets, and siphons.

Syllabus

The module will teach the following:

Unit and dimensions, Dimensional Homogeneity. Systems and the properties of systems such as pressure, temperature and energy. An introduction to energy conversion processes and systems involving work and heat transfer. Conversion of energy from one form to another. The First Law of Thermodynamics. Non flow processes involving perfect gases. The Continuity Equation, Bernoulli's Equation, Applications to flow in pipes, nozzles, siphons.

Assessment of Learning Outcomes

Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1 Understand the basic principles of conservation of energy, work and heat transfer for a closed system
C1 The ability to identify a suitable thermodynamic system and the energy exchanges associated with it.
C2 To recognise and draw PV diagrams and calculate the thermodynamic work for various process paths.
C3 To express heat transfer balances and calculate the heat transfer rates for simple heat transfer problems.

LO2 Apply the First law of Thermodynamics to a range of closed and open system problems
C1 To recognise the physical significance of a number of thermodynamic process paths.
C2 To formulate energy balances for a variety of thermodynamic processes.
C3 To calculate the work, heat transfer and energy content changes for a variety of thermodynamics processes.
C4 To use the steady flow energy equation to analyse problems.

LO3 Understand the basic principles of fluid flow, the continuity equation, and Bernoulli's Equation
C1 To describe and draw simple flow patterns of internal and external flows.
C2 To be able to write unaided and explain each term of the continuity and Bernoulli equation.

LO4 Apply the basic equations of fluid flow to problems involving pipe flow, nozzles and jets, and siphons
C1 To calculate the flowrates in pipe flows using the continuity equation.
C2 To calculate the pressures and velocity changes for changes in configuration using the Bernoulli equation.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback
(within Assessment and Feedback Policy at: https://www.strath.ac.uk/professionalservices/staff/policies/academic/)

General class feedback will be provided on the return of coursework and examination scripts. Overall class performance will be discussed for the Semester 1 exam and where satisfactory performance has not been achieved individual feedback will be provided.

Informal feedback will be provided at regular tutorial sessions primarily through verbal discussion with individuals or groups on tutorial exercises attempted in advance by students (note:- to receive this feedback students should participate in these tutorials but attendance is not mandatory).

Assessment Method(s) Including Percentage Breakdown and Duration of Exams *(individual weightings)*

Examination				Coursework		Practical		Project	
Number	Month(s)	Duration	***Weighting***	Number	***Weighting***	Number	***Weighting***	Number	***Weighting***
2	Dec May	1.5hrs 1.5hrs	25% 55%	4	20% (5% Each)				
* LO1, LO2, LO3, LO4				* LO1, LO2, LO3, LO4		*		*	

* ***L/Os:*** *Indicate which Learning Outcomes (L01, L02, etc) are to be assessed by exam/coursework/practical/project as required.*

Coursework / Submission deadlines (*academic weeks*):
Homework is an online exercise, attempted at home within a fixed time period.

Resit Assessment Procedures:
2 hour examination in August diet

PLEASE NOTE:
Students must gain a summative mark of 40% to pass the module. Students who fail the module at the first attempt will be re-assessed during the August diet. This re-assessment will consist entirely of exam. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

*****Purchase recommended **Highly recommended reading *For reference**

Online access Myplace for class notes, tutorial and previous exam papers

*** "Fundamentals of Thermal-Fluid Sciences" by Cengel , Turner & Cimbala, McGraw-Hill

Additional Student Feedback
(Please specify details of when additional feedback will be provided)

Date	Time	Room No
By student request only: Dr K Zografos to arrange (additional feedback - on exam or homework - will be provided on request).	Email to arrange	JW808g

Session: 2021/22

Approved:

Course Director Signature: Dr E Henderson (SG)
Date of Last Modifications: September 3, 2021

(Updated July 2021-MAE)

MODULE TIMETABLE

Module Code:	**ME101**	**Module Title:**	**Heat and Flow 1**

Brief Description of Assessment:

Students will be examined by a 1.5-hour online exam in December on topics taught in semester 1 and will include units and dimensions, Energy, Work and Heat transfer. A further 1.5-hour online exam in April/May will cover the topics, First Law of Thermodynamics, application of thermodynamics processes and fluid flow problems using the continuity and Bernoulli equations.

Four online courseworks will be issued, two per semester based on the topics covered in each semester.

Assessment Timing

Indicated on the table below are the start/submission dates for each assignment/project and the timing of each exam/assessment. Dropdowns may be left blank. Add extra notes below the dropdowns where relevant.

Please note: Timings can and will change, this should only be used as a guide.

Semester One	W&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Submit	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Submit	Choose an item. Choose an item.	Choose an item. Choose an item.	Exam

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Submit	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Submit	Choose an item. Choose an item.	Exam