MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME101 HEAT AND FLOW 1

Module Registrar: Dr William Dempster william.dempster@strath.ac.uk	**Taught To (Course): Mechanical, Electrical/Mechanical, Product Design and MEM.**	
Other Lecturers Involved: Dr Umer Saleem	**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**
22	22							56	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 basic fluid properties and principles of fluid statics.

LO4 Understand the basic principles of fluid flow, the continuity equation, and Bernoulli's Equation.

LO5 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 fundamental equation of hydrostatics and applications to manometers. The Continuity Equation, Bernoulli's Equation and 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 basic fluid properties and principles of fluid statics.
C1 To be familiar with the concept of pressure including the difference between gauge and absolute values
C2 To be able to formulate equations utilising the fundamental equation of hydrostatics for different types of manometry problems.
C3 To be able to explain the concepts of buoyancy and apparent weight.

LO4 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.

LO5 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 semester 1 assessment. Overall class performance will be discussed and where satisfactory performance has not been achieved individual feedback can be provided.

Informal feedback can 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). Solutions to selected tutorial questions will be presented and discussed. Informal feedback will also be provided through online discussion forums on tutorial exercises attempted and submitted by students.

Discussion of the course material amongst peers will also be encouraged in tutorial sessions and through online discussion forums to improve student learning.

Feedback and solutions will be provided to students who attempt the formative online homework exercises. This feedback will be provided immediately after the deadline / quiz closes. This will enable students to reflect on their understanding of the subject material throughout the year and prior to each semester examination.

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***
1	Apr/May	1.5hrs	75%	1	25%				
* LO1, LO2, LO3, LO4, LO5				* LO1, LO2		*		*	

* ***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*):
1 hour online time constrained quiz in semester 1 week 11.

Resit Assessment Procedures:
2 hour examination in July/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 before/during the July_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	Email to arrange	

Session: 2024/25

Approved:

Programme Lead/Director Signature: Dr A McLaren

Date of Last Modifications: 04/08/2024

(MAE template updated July 2024)

MODULE TIMETABLE

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

Brief Description of Assessment:

Students will be examined via a 1-hour online time constrained quiz in week 11 of semester 1 on topics taught in semester 1 including units and dimensions, Energy, Work and Heat transfer (marked below as coursework).

A 1.5-hour on-campus written exam in April/May will cover the topics taught in semester 2 including First Law of Thermodynamics, application of thermodynamics processes, fluid static problems using the fundamental equation of hydrostatics and fluid flow problems using the continuity and Bernoulli equations.

Formative time constrained online quizzes (homework exercises) throughout the year.

Assessment Timing

Indicated on the table below are the start/submission dates for each assignment/project and the timing of each exam/assessment.

Please note: Timings could change during unforeseen periods of disruption; 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.	Homework Exercise Set	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Homework Exercise Set	Choose an item. Choose an item.	Coursework Submit	Choose an item.

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.	Homework Exercise Set	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Homework Exercise Set	Choose an item. Choose an item.	Exam