MODULE DESCRIPTION FORM

ME101 HEAT and FLOW 1

Module Registrar: Dr W Dempster
william.dempster@strath.ac.uk

Taught To (Course): Mechanical, Electrical/Mechanical, Product Design and Man. Science

Other Lecturers Involved:

Credit Weighting: 10

Semester: 1 and 2

Assumed Prerequisites: Mathematics and Physics at SQA Higher level or equivalent

Compulsory class

Academic Level: 1

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

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Tutorial</th>
<th>Laboratory</th>
<th>Groupwork</th>
<th>External</th>
<th>Online</th>
<th>Project</th>
<th>Assignments</th>
<th>Private Study</th>
<th>Total</th>
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<td>24</td>
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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.
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:

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 properties of systems such as pressure, temperature and energy. 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 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.

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 unaiderd 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.

12 Principles of Assessment and Feedback
(on Learning & Teaching web pages: www.strath.ac.uk/learnteach/informationforstaff/staff/assessfeedback/12principles/)

General class feedback will be provided on the return of coursework and examination scripts. Overall class performance will be discussed for the mid-term exam and students with a lower performance will be given the opportunity for individual feedback.

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

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tbody>
<tr>
<td>LO1, LO2, LO3, LO4</td>
<td>2</td>
<td>January</td>
<td>1.5 hours</td>
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<tr>
<td>May</td>
<td>2 hours</td>
<td>55% January</td>
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<tr>
<td>LO1, LO2, LO3, LO4</td>
<td>5</td>
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<td>20%</td>
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Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

Coursework / Submissions deadlines:
4 courseworks distributed in equal intervals throughout teaching period

Resit Assessment Procedures:
2 hour examination in August.

PLEASE NOTE:
Students need to gain a summative mark of 40% to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of exam

Recommended Reading

****Purchase essential; ***Purchase recommended; **Highly recommended reading; *Simply for reference (do NOT purchase)

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)

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Session 14/15: additional feedback will be provided as necessary at tutorial sessions

Approved:

Course Director Signature: [Signature]

Date of Last Modifications: 03 September 2014
**MODULE TIMETABLE**

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

**Brief Description of Assessment:**
1.5 hour Jan  
2 hour exam May  
5 Home work exercises

**Assessment Timing:**
Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment(s).

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<th>Semester One</th>
<th>WK1</th>
<th>WK2</th>
<th>WK3</th>
<th>WK4</th>
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<th>WK6</th>
<th>WK7</th>
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<th>WK11</th>
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<td>EXAM January</td>
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<td>Semester Two</td>
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<td>CW4</td>
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<td>EXAM May/June</td>
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