Mechanical engineering: heat and flow T229

Presentation pattern: October to June

Module description

T229-Mechanical Engineering: Heat and Flow, is the first 30 credit module in the new Mechanical Engineering pathway of the Open University's undergraduate engineering qualification.

There is an expectation when studying this module, that students are familiar with engineering skills such as energy and work, have a basic understanding of properties of fluids, as well as a good grounding in mathematical skills such as calculus, differentiation and integration. It is recommended that students have passed Engineering: maths, modelling, applications (T194) or equivalent study and have successfully completed (or be in the process of completing) core engineering modules at Stage 2.

T229 has been designed in three parts; each part is presented as a printed book with associated online activities. **Part 1** focuses on thermodynamics; **Part 2** covers fluid mechanics and **Part 3** is about heating, cooling and sustainability.

In **Part 1** Thermodynamics, students will consider different forms of energy and how it transforms from one to another. They will then discover the limits to these transformations, and the directionality of these processes before learning how heat energy can be harnessed to do mechanical work using a heat engine. This understanding will then be applied to both steam turbines for power generation and jet engines for transport. The reverse process, the heat pump is introduced, as the basis of the refrigeration cycle. Its usefulness in both geothermal power and food preservation is explained.

In **Part 2** Fluid Mechanics, looks at the behaviour of liquids and gases moving in a wide range of situations, from domestic plumbing to hurricanes and from jet engines to hydraulic braking systems such as that found in various forms of transport. Students will learn how physical and mathematical models help engineers to understand the behaviour of fluids and to solve real-world problems.

In **Part 3** Heating, Cooling and Sustainability, students will apply their knowledge to design the heating and cooling of 'low carbon' buildings and will learn about heat transfer mechanisms within buildings; including radiators, insulation and heat exchange mechanisms. Students will consider the role of engineers in reducing greenhouse gas emissions in the context of global climate policies and will be taught how to apply Life Cycle Assessment to buildings.

Throughout the module there will be opportunities to complement and enhance theoretical knowledge by carrying out a number of relevant experiments. In **Parts 1 and 2,** students will remotely access Open Engineering Laboratory facilities at the Open University to carry out experiments and acquire data in real time.

In **Part 3**, they will gain skills in heat transfer analysis by exploring the use of the industry standard finite element analysis (FEA) software package, ANSYS. In the latter part of the module, students will also learn more about teamwork, before applying this approach to a group project, to design a low-carbon building. If students have concerns about working in a group then they will be advised to talk these through with their tutor as soon as possible.

Module material is provided in three printed books along with associated online activities on the T229 module website. In order to successfully study this module, students need to access both the online and printed materials. A Module Map and Study Planner are available for students to use when planning their study,.

The Module Map shows the overall structure of the module and the key assessment dates, with each week displaying detail of what students will be studying. Each week the Study Planner has an Essential Overview which shows what needs to be studied and the order in which to study the print and online materials.

At the successful completion of this module students will be well prepared to progress to the second Mechanical Engineering module, T329.

Person specification

The person specification for this module should be read in conjunction with the generic person specification for an associate lecturer at The Open University.

As well as meeting all the requirements set out in the generic person specification, you should have:

- either an engineering degree or equivalent
- an understanding of thermodynamics and fluid mechanics
- experience of using spreadsheets in analysing experimental data
- the ability to support group work
- experience with Finite Element Analysis (FEA) software (for example: ANSYS) to teach simple analysis **OR** a willingness to learn that and other new analytical techniques
- knowledge of Maths in an engineering context including the elementary vector derivatives and integrational analysis, (e.g. use of div, grad and curl).

It would be an advantage to have:

- experience teaching engineering at HE level
- an understanding of supervising small group experimental work
- the ability to explain the importance of the role of engineering in addressing climate change
- some industrial experience of engineering and/or design.

Additional information

Tuition will be provided through a mix of face-to-face and online tutorials using Adobe Connect, forums and other online tools; including the Open STEM lab and Open engineering studio.

This module will be assessed by:

- three tutor-marked assignments (TMAs), one for each part
- three interactive computer-marked assignments (iCMAs), again one for each part
- an end of module assessment (EMA).

Also, most weeks include a Practice quiz, on the mathematical elements of the module to help prepare students for the assessments.

Module related details - a full explanation can be found on the website

Credits awarded to the student for the successful completion of a module:	30
Number of assignments submitted by the student:	4
Method of submission for assignments:	2
Level of ICT requirements:	2
Number of students likely to be in a standard group:	20
Salary band:	4
Estimated number of hours per teaching week:	3