

*Presentation pattern*    April to September

*Module description*

T272 builds on the engineering concepts and mathematics in *Engineering: origins, methods, context* (T192), *Engineering: frameworks, analysis, production* (T193), *Engineering: mathematics, modelling, applications* (T194) and *Core engineering A* (T271).

Following an introduction to the mechanics of solids and stress analysis of engineering structures aiming to predict or design against failure, it goes on to explore techniques for modelling and analysing motion of components for engineering design. The failure and degradation mechanisms that interact with engineering components over time and reduce their lifetime in service follows, concluding with how materials can be engineered for increased resilience against these degradation mechanisms.

The module is presented in three parts, with blended support through printed books and online resources. All study is guided from the module website, which includes interactive online activities, practice quizzes and media assets to further develop understanding. Opportunities to communicate and work online with other students are also available.

Theoretical underpinning will be enhanced by relevant experiments in the interactive OpenEngineering remote laboratory. Industrially relevant skills in core aspects of stress and structural analysis are explored through the use of an industry standard Finite Element Analysis (FEA) software package.

Part 1 of this module develops an understanding of different types of loading and stress in engineering structures and will move on to explore complex stress analysis in two dimensions. Real-world engineered products will be used as case studies to demonstrate how engineering structures experience combined loading conditions leading to complex stress states. Alongside hand calculations for stress analysis, computer-based methods will be introduced. The use of a finite element analysis software, for the stress analysis of simple engineering structures is also explored, alongside the identification of failure criteria and how stress analysis could be used to predict or design against failure.

Part 2 is all about motion and looks at describing, modelling and analysing motion, through the movement of objects, by looking at the forces that are acting on those objects. Different types of motion including vibration and oscillating movements are introduced together with the mathematics behind them. How different types of motion can be converted, through a variety of mechanisms, is explored before investigating design methods which encourage good vibration when required, or limit unwanted vibration that may cause damage.

The final part of the module is about what limits the useful life of engineered components and what engineers can do to make them last longer. It will explore how both the environment in which a component operates and its surroundings in service, interact with it in such a way as to put a time limit on its usability. Some of the ways that engineers have extended a component's lifetime in service, by choosing the right material before manipulating or treating it in some way are then introduced.

As in previous modules, the teaching of mathematics will be integrated into the engineering materials giving both context and an opportunity to practice its applications. Interactive quizzes provide a chance to practise mathematics and engineering applications in preparation for the interactive computer-marked assignments (iCMAs). Assignment questions will be based on activities in the module print and online material.

By the end of this module students will be well prepared for any of the specialist module at Level 2 and progress to the next phase of their chosen qualification.

### *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 be able to demonstrate:

- Either an engineering degree *or* experience teaching engineering at HE level or equivalent
- Demonstrable understanding of statics, dynamics and materials engineering
- Experience of using IT tools in solving engineering problems
- Demonstrable understanding of chemistry including simple atomic/molecular models, half equations and a basic knowledge of electrochemistry
- Ability to apply engineering knowledge to an abstract or poorly-defined problem or in a new area
- Experience with Finite Element Analysis (FEA) software (for example: ANSYS) to teach simple finite analysis **AND** a willingness to learn that and other new techniques
- Experience of teaching Maths in an engineering context including the elementary calculus of vectors, (e.g. differentiation of vectors in plane polar coordinates), vector cross and dot products and solving single variable first and second-order differential equations

It would be an advantage to have:

- Some industrial experience of engineering and/or design
- Experience with engineering simulation tools E.g. ANSYS or ABAQUS

Additional information:

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

*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:	2
Method of submission for assignments:	2
Level of ICT requirements:	2
Number of students likely to be in a standard group:	20
Salary band:	3
Estimated number of hours per teaching week:	5