WM3D3-15 Stress Analysis

24/25

Department
WMG
Level
Undergraduate Level 3
Module leader
Hesam Khajehsaeid
Credit value
15
Module duration
1 week
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

To design new products or optimise existing ones, stress analysis is a key tool to investigate the possibility of using new materials, new geometries or a combination of both.

Module web page

Module aims

By continuing the applications of the mechanics of materials theories, the participants acquire the ability to determine the response of structures to external mechanical stimuli, the resulting deformations and the state of stress and strain produced in the components of structures. They also learn to predict and prevent common forms of structural failure in basic engineering components. This module deals with knowledge of stress analysis as applied to the design of mechanical systems within the automotive, aerospace and product development industry. It will enable the participants to carry out both analytical and numerical methodologies while enhancing their capabilities in utilising engineering packages.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be

covered. Actual sessions held may differ.

- Revision of Theory of Stress and Strain
- Torsion of Shafts
- Analysis and Design of Beams for Bending
- Multi-axial loadings and complex states of Stress
- Principal Stresses / Stress Transformation
- Failure criteria
- Mechanical / Material testing for Stress / Strain Analysis
- Introduction to Fracture Mechanics
- Fatigue Failure Analysis
- Numerical Methods for Stress Analysis

Learning outcomes

By the end of the module, students should be able to:

- Appreciate the concepts of stress and strain as a result of external loadings/deformations on mechanical parts and components
- Implement stress analysis approach to design based on failure criteria for structural analysis or product development in a wide range of industrial sectors
- Develop an industrial-oriented application of the principles of static and strength of materials on stress analysis and apply them to solve analytical solutions to axial, bending, shear and combined loadings.
- Critique designs based on the stress analysis approach .

Indicative reading list

- Mechanics of Materials, BEER, F. P., JOHNSTON, E. R., DEWOLF, J. T. & MAZUREK, D. F., McGraw-Hill Education, 2015, ISBN 9814595241.
- Statics and Mechanics of Materials, HIBBELER, R. C. Pearson, 2017, ISBN 0134382595.
- Mechanics of materials: an introduction to engineering technology, GHAVAMI, P., Springer, 2014, ISBN 3319075721.

View reading list on Talis Aspire

Subject specific skills

Basic knowledge on interpreting stress-strain curves, recognising type of loading and state of stress/strain on parts/components. Predict/prevent structural failure in engineering components. Selection of materials for structural design.

Transferable skills

Dependability, Teamwork, Adaptability, Technology Literacy

Study

Study time

Type	Required
Lectures	18 sessions of 1 hour (12%)
Seminars	6 sessions of 1 hour (4%)
Practical classes	6 sessions of 1 hour (4%)
Private study	60 hours (40%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Review of content and practice on provided problems/solutions.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time	Eligible for self-certification
IMA - Group Work	30%	15 hours	No
Assignment during the teaching week (In-module assignment; IMA; group work 2000 +/-10% words)			
Post Module Assignment	70%	45 hours	Yes (extension)
Post module Assignment Case study; (70% 2800 +/-10%words)			

Feedback on assessment

Individual/group feedback during the seminar sessions and In-module assignment (if applicable) and summative generic (cohort) feedback for the PMA case studies.

Availability

Courses

This module is Core for:

- Year 4 of DWMS-H7C8 Undergraduate Applied Professional Engineering (Product Design and Development Engineer) (Degree Apprenticeship)