Product Analysis

Module Information

2022.01, Approved

Summary Information

Module Code	5265PDE
Formal Module Title	Product Analysis
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
Engineering

Learning Methods

Learning Method Type	Hours
Lecture	22
Tutorial	22

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
JAN-CTY	CTY	January	12 Weeks

Aims and Outcomes

Aims	This module introduces the fundamentals of the Finite Element Method as an optimization tool used within the product development lifecycle. Alongside Finite Element Analysis, measurement techniques and hand calculations will be considered as validation tools.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Apply material properties; mesh; loads and fixtures to a range of single component stress problems
MLO2	2	Define interaction between parts for multi-component stress problems
MLO3	3	Execute thermal analyses, defining heat loads for steady state and transient studies
MLO4	4	Identify and apply 2D simplification methods to static and thermal problems
MLO5	5	Identify methods to reduce model size, and apply appropriate subsequent symmetry conditions

Module Content

Outline Syllabus	Finite Element Analysis• An introduction to the Finite Element Method and it's applications• Software fundamentals: setting up basic studies and interpreting results• Single component stress analysis: application of boundary conditions and mesh manipulation• Multi-component stress analysis: defining interaction between parts in an assembly• Thermal analysis: thermal loads for steady state and transient conditions• 2D simplification methods: planar; axi-symmetric; and surface modelling• Partial models and defining symmetric boundary conditionsValidation methods• Use of static strength of materials relationships to model mechanical problems numerically• Use of thermodynamic relationships to model heat problems numerically• Techniques used to directly measure physical responses from prototypes under load (theory only)
Module Overview	**Aims** **This module introduces the fundamentals of the Finite Element Method as an optimization tool used within the product development lifecycle. Alongside Finite Element Analysis, measurement techniques and hand calculations will be considered as validation tools.** **Learning Outcomes** **After completing the module the student should be able to:** **1 Apply material properties; mesh; loads and fixtures to a range of single component stress problems.** **2 Define interaction between parts for multi-component stress problems.** **3 Execute thermal analyses, defining heat loads for steady state and transient studies.** **4 Identify and apply 2D simplification methods to static and thermal problems.** **5 Identify methods to reduce model size, and apply appropriate subsequent symmetry conditions.**
Additional Information	UN Sustainable Development GoalsThis module includes content which relates to the following UN Sustainable Development Goals:SDG09 – this module considers how FEA can be used to accelerate product design lifecycles, and how this can bring products to market at a faster rate, boosting industrial productivity in a sustainable manner.SDG12 – this module considers how FEA can reduce the need for fabrication and testing of multiple prototype iterations, ultimately reducing waste, and limiting carbon expenditure in product development environments.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Report	Single component	20	0	MLO1
Report	Multi-component	80	0	MLO2, MLO3, MLO4, MLO5

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Andrew Naylor	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings