DSGN H4601: Advanced Simulation

Module Title:	Advanced Simulation
Language of Instruction:	English

Credits:	5

NFQ Level:	8

Module Delivered In	1 programme(s)

Teaching & Learning Strategies:	The module will be delivered using lectures and tutorials with a mixture of presentations, example exercises, question and answer sessions, group discussions and online resources. Laboratory classes will be delivered to students working in groups to obtain experimental data with subsequent individual reporting/assessment.

Module Aim:	The aim of this module is to provide students with an in-depth understanding and best practice of advanced design processes including CFD & FEA and the application of computer technologies to these areas.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Develop mesh generation strategy for two and three dimensional geometrical arrangements using industry standard software.
LO2	Apply advanced F.E.A. & C.F.D. techniques to typical design problems;
LO3	Perform parameter based DOE and design optimisation
LO4	Write technical reports in the style of a journal paper

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
DSGN H3601 Advanced Manufacturing or equivalent

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Module Content & Assessment

Indicative Content
Meshing • ANSYS Meshing Basics • Meshing Methods • Global Mesh Controls • Local Mesh Control • Assembly Meshing • Mesh Quality
Finite Element Analysis General Pre-processing, Modelling Connections, Remote Boundary Conditions and Constraint Equations, Static Structural Analysis, Modal Analysis, Thermal Analysis, Multistep Analysis, Results and Post-Processing,
Introduction to Computational Fluid Dynamics • Introduction to the CFD Methodology • Cell Zone and Boundary Conditions • Post-Processing with Fluent and CFD-Post • Solver Settings • Turbulence Modelling • Heat Transfer • Transient Flows • Moving Zones • Multiphase Flows • HPC • Best Practices
Heat Transfer Modelling • Introduction • Conduction Heat Transfer • Forced Convection • Natural Convection • Radiation Heat Transfer • Solar Load Model • Heat Exchangers • Heat Transfer in Porous Media • Best Practices
Mechanical Nonlinear Connections and Contact • Interface Treatments • Bolt Pretension • Modeling Gaskets • Accessing Advanced Contact Features via MAPDL • General Contact Technology • Best Practices
Mechanical Dynamics • General understanding of the different types of dynamic analyses. • Procedure for performing FEA simulations, including modal, harmonic, random vibration, response spectrum, and transient structural analyses • Best Practices
CFD Dynamic Meshing • Dynamic Mesh Zones with UDF's and Profiles • Layering Mesh Method • Smoothing Mesh Method • Remeshing • Coupled 6DOF • Convergence • Best Practices

Assessment Breakdown	**%**
Continuous Assessment	50.00%
Project	50.00%

Continuous Assessment				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Students will be required complete on site lab tasks	1,2,3	50.00	Ongoing

Project				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Project	Students will complete projects investigating design issues using CAD/FEA & CFD packages	1,2,3,4	50.00	n/a

No Practical

No End of Module Formal Examination

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lab/Lecture	12 Weeks per Stage	1.00
Laboratory	12 Weeks per Stage	3.00
Estimated Learner Hours	15 Weeks per Stage	5.13
	Total Hours	125.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EMMEC_B	Bachelor of Engineering (Honours) in Mechanical Engineering	7	Mandatory