Liverpool John Moores University

Title:	DESIGNING AGAINST FAILURE
Status:	Definitive
Code:	**6004TECH** (105316)
Version Start Date:	01-08-2016
Owning School/Faculty:	Maritime and Mechanical Engineering
Teaching School/Faculty:	Maritime and Mechanical Engineering

Team	Leader
Glynn Rothwell	Y

Academic Level:	FHEQ6	**Credit Value:**	12	**Total Delivered Hours:**	30
Total Learning Hours:	120	**Private Study:**	90		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	20
Practical	10

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Essay	AS1	Failure Mode Investigation	25	
Essay	AS2	Lifetime Service Requirements Report	25	
Essay	AS3	Design Optimisation Exercise	50	

Aims

To enable students to design products, components and assemblies that are resistant to failure.

Learning Outcomes

After completing the module the student should be able to:

1 Identify the relevant modes of failure for components and assemblies under load.
2 Identify the lifetime service requirements of a product or assembly.
3 Predict the lifetime of a product or assembly under a range of conditions.
4 Optimise the design solution to minimise the risk of failure.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

CW	1			
CW	2			
CW	2	3	4	

Outline Syllabus

Review of basic concepts of stress and strain, direct strain, bending and torsion. Failure mechanisms in design. Design against yielding - material properties; TRESCA; von Mises; factors of safety; use of finite element techniques; review of output.
Design against failure - basic mechanisms of fatigue and fault fracture; S-N curves; modification factors due to geometric, surface and environmental factors. Fatigue life prediction; goodmans rule for effect of mean stress; minors rule for cumulative damage. Joining methods and review of load paths.
Design against brittle fracture-ductile to brittle transition for metals and polymers; temperature effects; RANKIN theory; maximum principle stress theory.
Design against corrosion and wear- galvanic series; mechanisms of corrosion; crevice, fretting; wear mechanisms; effect of work hardening.

Learning Activities

A range of case studies, visual laboratories and a structured lecture programme will be employed in the delivery of this module.

Notes

A very traditional syllabus, but delivery will be in an accessible form for this programme.