Liverpool John Moores University

Title:	MATERIALS AND STRUCTURAL INTEGRITY
Status:	Definitive
Code:	**6085ENG** (115900)
Version Start Date:	01-08-2011
Owning School/Faculty:	Engineering
Teaching School/Faculty:	Engineering

Team	Leader
Gareth Bradley	Y

Academic Level:	FHEQ6	**Credit Value:**	10.00	**Total Delivered Hours:**	51.00
Total Learning Hours:	100	**Private Study:**	49		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	21.000
Practical	6.000
Tutorial	21.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	70.0	3.00
Report	AS2	Coursework - Laboratory based assignment 1	15.0	
Report	AS3	Coursework - Laboratory based assignment 2	15.0	

Aims

To enable students to develop an advanced understanding of the analysis and expected performance of engineering materials.

Learning Outcomes

After completing the module the student should be able to:

1 Undertake limit load and plastic analysis of engineering structures.
2 Undertake structural integrity analysis for both ductile and brittle materials
3 Apply experimental and numerical techniques for stress analysis
4 Apply a range of techniques for improving engineering properties of materials.
5 Relate how the properties and behaviour of materials govern their design and manufacture through consideration of the basic mechanisms involved.
6 Select materials/process to meet the performance requirements of engineering applications.

Learning Outcomes of Assessments

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

EXAM	1	2	3	4	5	6
Laboratory based assignment 1	1	2	3			
Laboratory based assignment 2	4	5	6			

Outline Syllabus

Plasticity and limit load analysis
Fatigue (S-N curves, factors affecting endurance limit, effect of mean stress, effect of load spectrum on cumulative damage).
Fracture mechanics (energy approach and stress intensity factor approach, plastic correction, sub-critical crack growth, post yield fracture, test methods, failure assessment diagrams).
Failure of brittle materials
Experimental stress analysis: strain gauges, photoelasticity, comparison with finite element analysis.
Environmental influences on materials
Advanced materials, processing and application (high performance alloys, ceramics and composites)
Structure, properties and application of engineering plastics and composite materials. Performance of materials in service and structural considerations
Performance oriented materials design and selection.

Learning Activities

Lectures, tutorials and practicals.

References

Course Material	Book

Author	Benham, Crawford and Armstrong
Publishing Year	1996
Title	Mechanics of Engineering Materials
Subtitle	
Edition	2nd Edition
Publisher	Longman
ISBN	0-582-25164-8

Course Material	Book
Author	Hearn, E. J.
Publishing Year	1999
Title	Mechanics of Materials 2
Subtitle	
Edition	3rd Edition
Publisher	Butterworth Heinemann
ISBN	0-7506-3266-6

Course Material	Book
Author	Ewalds and Wanhill
Publishing Year	1996
Title	Fracture Mechanics
Subtitle	
Edition	7th Edition
Publisher	Arnold
ISBN	0-7131-3515-8

Course Material	Book
Author	Ashby, M. F. and Jones, D. R. H.
Publishing Year	1996
Title	Engineering Materials Vol 1 & 2
Subtitle	
Edition	2nd Edition
Publisher	Butterworth-Heinemann
ISBN	0-750-63081-7

Course Material	Book
Author	Crawford, R. J.
Publishing Year	1998
Title	Plastics Engineering
Subtitle	
Edition	3rd
Publisher	Butterworth-Heinemann
ISBN	0-750-63764-1

Course Material	Book
Author	Lancaster, J. F.
Publishing Year	1999

Title	Metallurgy of Welding
Subtitle	
Edition	5th Edition
Publisher	Woodhead
ISBN	1-855-73428-1

Notes

The module will provide an in depth understanding of the analysis and performance of materials.