

Liverpool John Moores University

Warning: An incomplete or missing proforma may have resulted from system verification processing

Title: Mechanical and Thermal Systems
Status: Definitive
Code: **5501ENGICA** (119145)
Version Start Date: 01-08-2018

Owning School/Faculty: Engineering
Teaching School/Faculty: HICOM University College Sdn,Bhd

Team	Leader
Russell English	

Academic Level: FHEQ5 **Credit Value:** 20 **Total Delivered Hours:** 51
Total Learning Hours: 200 **Private Study:** 149

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	30
Practical	8
Tutorial	10

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Laboratory Report x 2 (thermofluids)	20	
Exam	Exam		60	3
Report	AS2	Laboratory Report x 2 (mechanical)	20	

Aims

To acquire the ability to appraise basic engineering structures, machine elements, thermal power producing plant and fluid flow regimes.

Learning Outcomes

After completing the module the student should be able to:

- 1 assess the structural integrity of components and structures under both static and cyclic loading.
- 2 employ the principles of mechanical vibrations for the appraisal of engineering problems.
- 3 appraise basic thermodynamic cycles with various working fluids and use tables and charts of vapour properties to solve thermodynamic problems, including the effects of irreversibility's.
- 4 evaluate fluid flow in pipe systems, heat transfer mechanisms and make use of dimensional analysis to simplify problems.

Learning Outcomes of Assessments

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

Lab report	3	4		
Exam	1	2	3	4
Lab report	1	2		

Outline Syllabus

Overview of modes of failure : fracture due to static overload, yield under static loading (gross plastic deformation), buckling in columns, excessive deformation, fatigue fracture, creep failure, failure due to combined effect of stress and corrosion, failure due to impact loading or thermal shock.

Stress analysis : 2-d stress / strain transformation equations , Mohr's circles for stress and strain. Application to thin walled vessels.

Modes of failure: yielding (Rankine, Tresca, von Mises), fatigue (S-N curves, factors affecting endurance limit, effect of mean stress, effect of load spectrum on cumulative damage).

Mechanical vibrations : Free and forced vibrations. Effect of damping. Force transmissibility and vibration isolation. Suspension systems.

Thermodynamics : Brief introduction to the Second Law of Thermodynamics, Reversibility, Carnot Theorem, Entropy, Isentropic efficiency of turbines and compressors. Properties of vapours, use of property tables and charts. Introduction to cycles for power production, Carnot, Rankine, Joule cycles, criteria of performance. Basic vapour compression refrigeration & heat pumps. Introduction to 1-D heat transfer (plane conduction & films).

Fluid Mechanics : Introduction to dimensional analysis, Rayleigh and Buckingham methods. model testing. Newton's Law of viscosity, dynamic and kinematics viscosity. Laminar and turbulent flow in pipes, Reynold's Number, friction factor, D'Arcy equation, Moody Chart.

Learning Activities

Lectures, tutorials and practical sessions

Course Material	Book
Author	Beer, F.P; Johnson, E.R; and DeWolf, J.T.
Publishing Year	2004
Title	Mechanics of Materials
Subtitle	
Edition	3rd
Publisher	McGraw Hill
ISBN	9780070535107

Course Material	Book
Author	Cengel, Y, A. and Boles, M.A.
Publishing Year	2010
Title	Thermodynamics :An Engineering Approach
Subtitle	
Edition	7th
Publisher	McGraw Hill
ISBN	9780077366742

Course Material	Book
Author	Douglas, J.F., Gasiorek, J.M., Swaffield, J.A., and Jack, L. A.
Publishing Year	2005
Title	Fluid Mechanics
Subtitle	
Edition	5th
Publisher	Prentice Hall
ISBN	9780131292932

Course Material	Book
Author	Eastop, T.D. and McConkey, A.
Publishing Year	1993
Title	Applied Thermodynamics for Engineering Technologists
Subtitle	
Edition	5th
Publisher	Longman
ISBN	9780470219829

Course Material	Book
Author	Ryder, G.H. and Bennet, M.D.
Publishing Year	1990
Title	Mechanics of Machines
Subtitle	
Edition	2nd

Publisher	MacMillan
ISBN	9780333536964

Notes

To acquire the ability to analyse basic engineering structures, machine elements, thermal power producing plant, heat transfer, refrigeration and fluid flow regimes.