Liverpool John Moores University

Title:	Mechanical and Thermal Systems
Status:	Definitive
Code:	**5505ENGRIV** (117212)
Version Start Date:	01-08-2016
Owning School/Faculty:	Maritime and Mechanical Engineering
Teaching School/Faculty:	Maritime and Mechanical Engineering

Team	Leader
Russell English	Y

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
Exam	Exam		60	3
Report	Rpt		20	
Report	Rpt		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:

Exam	1	2	3	4
Report Thermo	3	4		
Report Mechanical	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

Notes

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