

Liverpool John Moores University

Title: DRIVE TRAIN AND SUSPENSION DESIGN
Status: Definitive
Code: **6091ENG** (115906)
Version Start Date: 01-08-2011

Owning School/Faculty: Engineering
Teaching School/Faculty: Engineering

Team	Leader
Keith Metcalfe	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	Drive Train Assignment	15.0	
Report	AS3	Suspension Performance	15.0	

Aims

To enable students to develop an understanding of the principles of automotive drivetrains and suspension systems.

Learning Outcomes

After completing the module the student should be able to:

- 1 Apply the principles of mechanics and dynamics to the design of power transmission systems.
- 2 Demonstrate a knowledge of passive/active suspension systems and components
- 3 Determine the kinetic and dynamic characteristics of suspension assemblies
- 4 Analyse basic steering systems.
- 5 Use computer modelling for the evaluation of system performance.
- 6 Identify common drivetrain components and configurations

Learning Outcomes of Assessments

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

EXAM	1	2	3	4	5
Drive Train Assignment	1	2	3	6	
Suspension Performance	1	4	6		

Outline Syllabus

Longitudinal Vehicle Dynamics: Acceleration (power limited & traction limited), Driveability (Shunt & Shuffle), Drivetrain Configurations: Conventional (FF,FR,RR,AWD) and Hybrid (Series, Parallel, Series-Parallel)
Drivetrain Components: Couplings (Clutch, Torque Converter), Transmissions (Gear trains, belt drives, CVT), Shafts
Drivetrain Modelling: Lumped-Mass dynamic modelling using modern simulation tools.
Suspension geometries: MacPherson strut, SLA
Evaluation of car handling characteristics: instant centres, roll centre, camber angle, caster angle, slip angle, tyre scrub, bump steer.
Suspension dynamics: weight distribution and transfer, anti-roll.
Steering: Steering linkage geometries, design principles, Ackermann, power assistance.
Modelling and Simulation: Use of computer software to model component characteristics.

Learning Activities

Lectures, tutorials, case studies and practical assignments.

References

Course Material	Book
Author	Bosch

Publishing Year	2001
Title	Automotive Handbook
Subtitle	
Edition	
Publisher	SAE International
ISBN	

Course Material	Book
Author	T.D. Gillespie
Publishing Year	1992
Title	Fundamentals of Vehicle Dynamics
Subtitle	
Edition	
Publisher	SAE International
ISBN	

Course Material	Book
Author	Milliken & Milliken
Publishing Year	1994
Title	Race Car Vehicle Dynamics
Subtitle	
Edition	
Publisher	SAE International
ISBN	

Course Material	Book
Author	Matschinsky, W
Publishing Year	2000
Title	Road Vehicle Suspensions
Subtitle	
Edition	
Publisher	Professional Engineering Publishing
ISBN	1860582028

Course Material	Book
Author	Uiker, J. J., Pennock, G.R., Shrihley. J. E.,
Publishing Year	2002
Title	Theory Of Machines and Mechanisms
Subtitle	
Edition	3rd
Publisher	OUP
ISBN	019515598x

Course Material	Book
Author	Reimpell, J.J., Stoll, H., Betzler, J.W.
Publishing Year	2001
Title	The Automotive Chassis

Subtitle	
Edition	
Publisher	Butterworth Heinemann
ISBN	0750650540

Notes

This module explores the fundamental principles of automotive drivetrains and suspension systems and their modeling in an applied and practical manner.