

Course unit title:	<i>Tribology for Automotive Systems</i>		
Course unit code:	AU 305		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (3rd Cycle)		
Year of study:	4		
Semester when the unit is delivered:	6 (Spring)		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Lecturer TBA based on Department's needs		
Learning outcomes of the course unit:	<ol style="list-style-type: none"> 1. Recognise and explain the characteristic features of surfaces, the techniques for analyzing surface roughness and define the mathematical description of surface roughness. 2. Define friction and discuss the different wear mechanisms. 3. Solve basic contact mechanic problems, including the ability to estimate contact pressure and real area of line and circular contacts. 4. Distinguish between the different lubrication regimes and examine solutions to lubricated problems. 5. Select appropriate materials for specific tribological applications and create solutions to specific tribological problems (such as friction and wear). 		
Mode of delivery:	Face-to-face		
Prerequisites:	ME201, ME200, ME304	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	<ul style="list-style-type: none"> • Introduction: Understand and describe the main laws and concepts of Tribology, identify Tribological phenomena, describe factors that influence tribological phenomena, explain the regimes of lubrication and the origins of the Stribeck curve. • Engineering surfaces: Describe methods for measuring surfaces, Identify finishing processes from a measured surface profile, describe and explain the most commonly used parameters in surface finish analysis • Contact of engineering surfaces: Explain the Hertzian theory of contacting surfaces, Define and solve smooth body contact problems, including estimations of the contact pressure and real area of line and circular contacts. Understand and solve simple problems associated with the friction and temperature rise of dry smooth contact. • Introduction to friction and wear theories: define Amontons' Laws of friction, describe sliding and rolling friction and compute the frictional force and the coefficient of rolling friction for a sphere rolling on a plane and a roller on a plane, Understand and define types of wear and classification system of wear mechanisms (mild and severe). Identify the actual physical mechanism of wear (adhesion, abrasion, oxidation, delamination, corrosion, melting, fretting etc.) Describe wear debris analysis, Ferrography. • Introduction to Hydrodynamic lubrication: Derive Reynolds equation and list and explain the main assumptions underlying this equation and its subsequent approximations. Use of the mobility method to design a journal bearing • Introduction to EHL and mixed lubrication theory: Describe and explain the lubrication of concentrated contacts (Martin solution and the half Sommerfeld solution). Estimate lubricant film thickness, pressure, friction and temperature in elastohydrodynamic lubricated contact and in mixed lubrication 		

Recommended and/or required reading:	
Textbooks:	<ul style="list-style-type: none"> • Introduction to Tribology by B. Bhusham, John Wiley & Sons, 2002 • Fundamentals of Fluid Film Lubrication, by Bernard J. Hamrock, Steven R. Schmid, Bo O. Jacobson, Marcel Dekker, 2nd edition, March 2004
References:	<ul style="list-style-type: none"> • Tribology, Principles and Design applications, by Arnell et al, Springer Verlag, 1993 • Fundamentals of Machine Elements, by Hamrock, Jacobson and Schmid, McGraw Hill, 1999 • Modern Tribology handbook, by B. Bhushan, CRC Press.
Planned learning activities and teaching methods:	Most part of course is delivered to the students by means of lectures and tutorials conducted with the help of power point presentations and hand notes. Lecture notes and presentations are available through the web (extranet) for students to use in combination with the textbooks.
Assessment methods and criteria:	<ul style="list-style-type: none"> • Assignments 20% • Tests: 20% • Final Exam 60%
Language of instruction:	English
Work placement(s):	No