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| Course Title | Tribology for Automotive Systems | | | | |
| Course Code | AU305 | | | | |
| Course Type | Compulsory | | | | |
| Level | BSc (Level 1) | | | | |
| Year / Semester | 3 rd Year / 6 th Semester | | | | |
| Teacher's Name | Dr. Antonios Lontos | | | | |
| ECTS | 0 | Lectures / week | 3 | Laboratories/week | 0 |
| Course Purpose | The purpose of the course is to understand and gain experience in the phenomenon of tribology between surfaces of different materials and be able to choose the correct materials for minimum wear. | | | | |
| Learning Outcomes | <p>By the end of the course, students must be able to:</p> <ol style="list-style-type: none"> 1. Recognize 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). | | | | |
| Prerequisites | ME000 | | Corequisites | None | |
| Course Content | <ol style="list-style-type: none"> 1. 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. 2. 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 3. 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. | | | | |

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| | <p>4. 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.</p> <p>5. 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</p> <p>6. EHL and mixed lubrication theory: Describe and explain the lubrication of concentrated contacts (Martin solution and the half Sommerfield solution). Estimate lubricant film thickness, pressure, friction and temperature in elastohydrodynamic lubricated contact and in mixed lubrication</p> |
| Teaching Methodology | <p>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.</p> |
| Bibliography | <p>(a) <u>Textbooks:</u></p> <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 <p>(b) <u>References:</u></p> <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. |
| Assessment | <p>The assessment consists of following methods for both the theoretical and practical part of the course. Each assessment method is assigned with a weight which is used for the calculation of the final grade.</p> <p style="text-align: center;">Assignments: 40% Final Exam (written): 60%</p> |
| Language | English |