

Course unit title:	Machine Elements and Analysis II		
Course unit code:	AU309		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (2 <sup>nd</sup> Cycle)		
Year of study:	3		
Semester when the unit is delivered:	6 (Spring)		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr. Antonios Lontos, Unit leader: Dr. Sotiris Omirou		
Learning outcomes of the course unit:	<ul style="list-style-type: none"> <li>• Design and calculate gears. Calculate forces on gears.</li> <li>• Design and calculate spur and helical gears.</li> <li>• Design and calculate bevel and worm gears.</li> <li>• Design and calculate mechanical springs (load, stresses, selection of material). Apply mechanical springs on machines and engineering mechanisms.</li> <li>• Calculate clutches and brakes.</li> <li>• Calculate and design power transition systems using belts.</li> <li>• Calculate roller chains, wire ropes, flexible shafts.</li> </ul>		
Mode of delivery:	Face-to-face		
Prerequisites:	AU308	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	<ul style="list-style-type: none"> <li>• <b>Manual and automatic gearboxes:</b> synchronisers, continuously variable transmissions, traction control, Types of gears, Tooth system, Contact ratio, Force analysis, Applications of gear design and power transmission in Automotive Industry.</li> <li>• <b>Various types of gears:</b> Design and calculation of Spur and Helical Gear systems. Design and calculation of Bevel and Worm Gear systems, Stresses and Strength.</li> <li>• <b>Mechanical Springs:</b> Design and selection of vehicle springs, Suspension springs and shock absorbers, Stresses in helical springs, Deflection of helical springs, Extension and Compression springs, Springs material, Fatigue loading, Design of springs, Miscellaneous springs.</li> <li>• <b>Vehicle Clutches and Breaks:</b> Brake system components and their characteristics, Brake analysis, anti-lock braking systems, Energy consideration, Temperature rise, Friction materials, Other brake technologies.</li> <li>• <b>Vehicle belts and chains:</b> Power transmission, efficiency, Flat belts, Belt drive, synchronous belts, Roller chain, Flexible shaft.</li> <li>• <b>Laboratory work:</b> Use of special software for calculating and drawing of various machine element (Autocad, 3D Drawings, Advanced assembly, SolidWorks, Simple Drawings and FEM Simulations, Software for machine elements calculations)</li> </ul>		
Recommended and/or required reading:	None		
Textbooks:	Fundamentals of Machine Elements, B. J. Hamrock, B. Jacobson, S. R. Schmid, McGraw-Hill Mechanical Engineering Design, Ch. R. Mischke, J. Edward Shigley, McGraw-Hill		
References:	Mechanical Design, An Integrated Approach, Ansel C. Ugural, McGraw Hill, 2004.		

	<p>Design of Machine Elements and Machines, Jack A. Collins, George H. Staab, Henry R. Busby, John Wiley &amp; Sons, 2002</p> <p>Mechanisms and mechanical devices by Neil Clater, Nichocals P. Chironis, Third Edition 2001</p> <p>Fundamental of Machines Components Design, Robert C. Juvinall, Kurt M. Marshek, Third Edition, 2000</p> <p>Machine Design: An Integrated Approach by Robert L. Norton, Robert L Norton, Prentice Hall, 2nd edition, 2000</p> <p>Machine Elements in Mechanical Design by Robert L. Mott, Prentice Hall, 3rd edition, 1998</p>
Planned learning activities and teaching methods:	Lectures, laboratories and tutorials are used in this subject and assignments are performed to evaluate the students understanding of the subject matter. A description is given at the beginning of the course in order for the students to get enough information on the main subjects of the course.
Assessment methods and criteria:	<ul style="list-style-type: none"> <li>• Tests: 40%</li> <li>• Final Exam: 60%</li> </ul>
Language of instruction:	English
Work placement(s):	No