

Programme of “Elementi Costruttivi” “Machine Elements”		
<ul style="list-style-type: none"> • Code: I0589 • Type of course: Compulsory • Level of course unit: 1st Cycle in Machine Design • Year of study: 3rd year , 1st semester 		
Number of ECTS credits: 6 (work-load 150-180 hours)		
Teacher: D'AMATO Enrico		
1	Course objectives	<p>The course provides the basic theory of machine elements design, leaving from basics of structural mechanics, and applied mechanics.</p> <p>On successful completion of this module, the student should understand the fundamental concepts of machine design and should be able to develop applications in industrial design.</p>
2	Dublin descriptors	<p>Topics of the module include:</p> <p><i>Fatigue failure resulting from Variable Loading:</i> Approach to Fatigue Failure in Analysis and Design. Fatigue-Life Methods. Stress Concentration and Notch Sensitivity; Fatigue Failure Criteria for Fluctuating Stress. Cumulative Fatigue Damage.</p> <p><i>Design of structural joints of mechanical component:</i> The Mechanics of Power Screws. Threaded Fasteners. Joints—Fastener Stiffness. Joints—Member Stiffness. Bolt Strength. Tension Joints—The External Load. Relating Bolt Torque to Bolt Tension. Statically Loaded Tension Joint with Preload. Gasketed Joints. Fatigue Loading of Tension Joints</p> <p><i>Welding, Bonding, and the Design of Permanent Joint:</i> Butt and Fillet Welds. Stresses in Welded Joints in Torsion. Stresses in Welded Joints in Bending. The Strength of Welded Joints. Static Loading. Fatigue Loading. Resistance Welding. Adhesive Bonding. Bolted and Riveted Joints Loaded in Shear.</p> <p><i>Shafts and Shaft Components:</i> Shaft Materials. Shaft Layout. Shaft Design for Stress. Deflection Considerations.</p> <p><i>Mechanical Springs:</i> Stresses in Helical Springs. The Curvature Effect. Deflection of Helical Springs. Compression Springs. Stability. Spring Materials. Helical Compression Spring Design for Static Service. Critical Frequency of Helical Springs. Fatigue Loading of Helical Compression Springs. Helical Compression Spring Design for Fatigue Loading. Extension Springs. Miscellaneous Springs</p> <p><i>Rolling-Contact Bearings:</i> Bearing Life. Bearing Load Life at Rated Reliability. Bearing Survival: Reliability versus Life. Relating Load, Life, and Reliability. Combined Radial and Thrust Loading. Variable Loading. Selection of Ball and Cylindrical Roller Bearings. Selection of Tapered Roller Bearings. Mounting and Enclosure.</p> <p><i>Spur and Helical Gears:</i> The Lewis Bending Equation. Surface Durability. Geometry Factors. The . Elastic Coefficients. Dynamic Factors. Overload Factors. Surface Condition Factors. Size Factors. Load-Distribution Factors. Hardness-Ratio Factors. Stress Cycle Life Factors. Reliability Factor. Safety Factor.</p> <p>On successful completion of this module, the student should</p> <ul style="list-style-type: none"> - have knowledge of basic techniques in Fatigue Design, - have knowledge of basic techniques in design of structural joints; - have knowledge of basic techniques in design and selection of machine elements for power transmission systems and several other general applications;
3	Prerequisites and learning activities	<p>The student must know Previous learnings: Strength and stiffness. Hardness. Temperature Effects. Equilibrium and Free-Body Diagrams. Shear Force and Bending Moments in Beams. General Three-Dimensional Stress. Elastic Strain. Uniformly Distributed Stresses. Normal Stresses for Beams in Bending. Shear Stresses for Beams in Bending. Torsion. Contact Stresses.</p>
4	Teaching methods and language	<p>Lectures and exercises. Language: Italian</p> <p>Ref. Text books</p> <ol style="list-style-type: none"> 1. J.E.Shigley, R.G.Budynas, J.K.Nisbett – Progetto e Costruzione di Macchine. Mc Graw Hill – Milano. English version: Budynas–Nisbett • <i>Shigley's Mechanical Engineering Design, McGraw Hill.</i> 2. R.C. Juvinall, K.M. Marshek - Fondamenti della progettazione dei componenti delle macchine. ETS Editrice - Pisa. English version: R.C. Juvinall and K.M. Marshek - Fundamentals of Machine Component Design. John Wiley & Sons.
5	Assessment methods and criteria	Written and oral exam.