


5 credits

30.0 h + 30.0 h

Q1

Teacher(s)	Raucent Benoît ;Simar Aude ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> • Functional analysis of machines and their components • Properties of component use • Elements of calculus of machine components.
Aims	<p>In consideration of the reference table AA of the program "Masters degree in Mechanical Engineering", this course contributes to the development, to the acquisition and to the evaluation of the following experiences of learning:</p> <ul style="list-style-type: none"> • AA1.1, AA1.2, AA1.3 • AA2.1, AA2.2, AA2.3 • AA3.1, AA3.3 • AA4.1, AA4.2 • AA5.1, AA5.3, AA5.4, AA5.5, AA5.6 • AA6.1, AA6.3, AA6.4 <p>Specific learning outcomes of the course</p> <p>1</p> <ul style="list-style-type: none"> • Write functional specifications for a machine • Identify the functionalities of a machine (actuation, bearing systems, transmission, sealing, ') • Estimate the installed and maximum power, the energetic consumption and the efficiency of a machine • Design a simple machine following an adapted methodology • Identify the basic hypothesis of elements dimensioning • Choose materials and their shape as a function of the service conditions • Dimensioning following various criteria (static strength, elastic deformation, fatigue, ') of usual elements (e.g. shafts) • Take into account in the dimensioning effects associated to stress concentration and residual stresses • Choose machine components (bearing, gasket, transmission) • Read and interpret the drawing of an existing machine • Hand drawing machine elements and overall drawings • Placing tolerances for a mechanical system <p>----</p> <p><i>The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".</i></p>
Evaluation methods	<p>The evaluation is based on work throughout the year (labs and PBL) and on an oral exam session. It includes:</p> <ul style="list-style-type: none"> • solving a problem (open book) • answering a theoretical question
Teaching methods	<p>Parts of the course are taught via lecture courses and labs. Other parts of the course are taught by PBL and a laboratory by groups of 6 students</p>
Content	<p>First part :functional analysis of machines and their components</p> <ul style="list-style-type: none"> • Functional requirements (Specification conditions) • Principal functions of components (actuation, bearing systems , transmission) • Origin of loads <p>Second part : properties of component use</p> <ul style="list-style-type: none"> • Geometric characteristics • Tolerances and adjustments, shape tolerances, surface conditions, roughness and scale effects • Residual stresses <p>Third part : elements of calculus of machine components</p> <ul style="list-style-type: none"> • Dimensioning in relation to elastic limits: calculus criteria, stress concentration, effects of residual stress, safety factors • Fatigue: dimensioning, calculus methods, residual stress effects

	<ul style="list-style-type: none"> • Current elements calculus
Inline resources	http://moodleucl.uclouvain.be/enrol/index.php?id=7487
Bibliography	<p>Livre obligatoire : MECA1821 : Conception des machines, Cahier des charges et avant projet, partie de B. Raucent. Fundamentals of Machine Component Design, R.C. Juvinall & K.M. Marshek, éd. J. Wiley and Sons. Méthode Active de Dessin Technique, A Ricordeau, C. Corbet, C. Hazard, ed Casteilla.</p> <p>Livres conseillés:</p> <p>Partie 1: Engineering Design Methods, N. Cross, ed. J. Wiley and Sons, 1991. Aide Mémoire de l'ELEVE Dessinateur et du Dessinateur Industriel, M. Norbert et R. Philippe, La Capitelle, Casteilla, 1987.</p> <p>Partie 2 : Roulements FAG, roulements à billes, roulements à rouleaux, palies, accessoires, catalogues WL 41 520 FA. Mémotech, productique, conception et dessin, C. Barbier et R. Bourgeois, collection A. Capliez, Educative, ed. Casteilla, 1988.</p> <p>Partie 3 : Materials Selection in Mechanical Design, M.F. Ashby, Butterworth-Heinemann. E-book disponible par la BST (connexion UCL obligatoire): http://www.sciencedirect.com/science/book/9781856176637 Materials - Engineering, Science, Processing and Design, M. Ashby, H. Shercliff, D.Cebon, Butterworth-Heinemann. Les livres peuvent être empruntés à la bibliothèque</p>
Other infos	PBL start from week 1
Faculty or entity in charge	MECA

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Mechanical Engineering	MECA2M	5		