UCLouvain

lmeca2780

2017

Introduction to Turbomachinery

5 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Arts Tony ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	The main focus of these lectures is directed towards axial steam and gas turbines. The description of radial gas turbines, as well as their operation, is of less importance. A short description of hydraulic machines ends the lectures.
Aims	In consideration of the reference table AA of the program " Master's degree civil engineer mechanics ", this course contributes to the development, to the acquisition and to the evaluation of the following experiences of learning: 1 • AA1.1, AA1.2, AA1.3 • AA2.1, AA2.2, AA2.3 • AA3.1, AA3.3 • AA5.1, AA5.2, AA5.5, AA5.6 • AA6.1, AA6.2 Explain the fundamental principles of design and operation of axial and radial turbomachines (turbines) - - - - *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".*
Evaluation methods	Evaluation Oral open book exam, allowing an in depth evaluation of the skills of the student
Content	• Energetical study of the operation of a turbine stage. Flow field in stationary nozzles. Expansion in a converging-diverging nozzle. Flow field in rotating blade rows. Degree of reaction. Operation of action and reaction machines. • Characteristic coefficients of the operation of a turbine stage. Velocity triangles. Determination of the aerodynamic angles of stationary and rotating blade rows. Various operation principles of a turbine stage. Efficiency of a turbine stage. Typical action and reaction stages. Curtis turbine. • Flow field in a cascade : various blade design methods. Evaluation of the aerodynamic performance of a blade row. • Determination of losses by experimental correlations. Secondary flows. Total-to-total efficiency of a turbine stage. • Radial equilibrium principles in turbines. Equations and general solutions. Description of particular solutions (free vortex, ...) • General design principles of large power steam turbines. Exit stage. • Industrial exploitation of steam turbines. Analysis of pressure and mass flow regimes. Heat and power production by steam turbines -General description and manufacturing particularities of axial gas turbines. • General description of radial turbines. Geometrical particularities. Characteristic coefficients. Loss analysis and efficiency. • General description of hydraulic turbines. Overall operation characteristics.
Inline resources	http://moodleucl.uclouvain.be/course/view.php?id=5393
Bibliography	Support : Note de cours disponibles au SICI. Bibliographie : • J.H. Horlock, Axial Flow Turbines, London Butterworth Scientific Publications • O.E. Balje, Turbomachines, A Guide to Design and Theory, John Wiley • W. Traupel, Thermische Turbomaschinen, Springer Verlag.
Other infos	Three visits to turbomachines companies are organized
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		