UCLouvain

lmeca2150

2020

Thermal cycles

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Bartosiewicz Yann ;
Language :	English
Place of the course	Louvain-la-Neuve
Aims	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: • AA1.1, AA1.2, AA1.3 • AA2.1, AA2.2, AA2.3, AA2.4 • AA3.1, AA3.2, AA3.3 • AA4.1, AA4.2, AA4.3, AA4.4 • AA5.1, AA5.3, AA5.4, AA5.5, AA5.6 • AA6.3 1 The student will acquire the necessary knowledge to understand, design and evaluate thermodynamic systems involved in power cycles. A the end of the course he/she will be able to: • Use the concept of exergy to evaluate the performance of a power cycle and complete the energy approach • To formulate a detailed analysis of losses and irreversibilities at each component of a power cycle and present results by plots/pie charts • To elaborate assumptions and setup models to simulate a steam, gas and combined cycles • To setup a code to simulate a complex power cycle under different conditions and performing energy/ exergy analysis - - - - *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	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** **Project:**Simulation of (i) a complex Rankine Cycle including breedings and reheat, (ii) a gaz turbine cycle, (iii) a combined cycle. The project can cover all or partly those cycles. The project also includes the energy and exergy analysis of those cycles. Exam: Closed book (3h). Understanding/theory/application. The Professor might proceed to a further oral exam for any student being involved in a technical issue or supected of fraud during the written exam. The final mak is calculated according the project and the exam marks. The relative weights of the project and exam is variable and calculated according the marks obtained in both evaluations. The exact calculation key is presented at the first lecture and in the moodle site (starting slides of the course). Quick tests could be done during the session. Those tests could be considered as trainings as well as certifications which will be then integrated into the final mark according a variable weights.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Lectures are physically (comodal or full e-lecture to comply with any change in the sanitary rules) given according an hybrid apporach: (i) Students are asked to read and study the content of the next course; (ii) during the first hour, the Professor gives a synthesis of the main points; (iii) during the second hour a strong interactivity between students and professor will be expected by Q&A and discussions. Some theoretical developments and thermodynamic reminders are done in class. Attendance is highly recommended as a permanent link between models/theory/formula and practical/technological arrangements is explained during the class. The spirit of the course is a permanent comparison between the classical energy approach and the exergy analysis. To apply the theory as seen in class, a project is organized over the whole session with periodic consultations by the assistant
Content	• Chapter 1: characterization of performances of driving engines • Chapter 2: Steam power cycles (Rnakine-Hirn) • Chapter 3: Gas power cycles (Brayton) • Chapter 4: Combined gas-steam cycles • Chapter 5: Combined heat and power cycles (CHP)

Inline resources	https://moodleucl.uclouvain.be/course/view.php?id=6963
Bibliography	• Thermal Power Plants - Energetic and Exergetic approaches", D. Johnson, Joseph Martin et Pierre Wauters, 2015, presses universitaires de Louvain, ISBN: 978-2-87558-408-3 (978-2-87558-409-0 en pdf) . **Obligatoire** • Slides disponibles sur Moodle **obligatoire** • Eléments de thermodynamique technique",Joseph Martin et Pierre Wauters, 2014, presses universitaires de Louvain (ISBN:978-2-87558-317-8 or 978-2-87558-318-5 en pdf) . **Recommandé** • Thermodynamique et énergétique: de l'énergie à l'exergie", L. Borel et D. Favrat, Presses polytechniques et universitaires romandes. **Recommandé** • "Thermal Power Plants - Energetic and Exergetic approaches", D. Johnson, Joseph Martin et Pierre Wauters, 2015, presses universitaires de Louvain, ISBN: 978-2-87558-408-3 (978-2-87558-409-0 in pdf). **Obligatoire** • "Eléments de thermodynamique technique",Joseph Martin et Pierre Wauters, 2014, presses universitaires de Louvain (ISBN:978-2-87558-317-8 or 978-2-87558-318-5 in pdf). **Recommandé** • Slides disponibles sur Moodle, **obligatoire** • "Thermodynamique et énergétique: de l'énergie à l'exergie", L. Borel et D. Favrat, Presses polytechniques et universitaires romandes. **Recommandé**
Faculty or entity in charge	MECA

Force majeure

Teaching methods	The course could be give online (e-learning) and in more formal way (ex catedra) as e-learning plateforms are less likely to give interation opportunity between students and professor.
Evaluation methods	In case of on-site exam (written, closed-book), the exam duration could be reduced according the faculty policy and sanitary rules. In case of off-site exam (because exceptional conditions), the exam (written, closed-book) could be supervised online (e-exam) and could have a reduced duration according the faculty policy and sanitary rules. The form and duration of the exam could be different according the exam session.

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		