

<p><b>Title:</b> Analysis of advanced thermal process systems / Analyse af avancerede termiske processer</p>
<p><b>ECTS credits:</b> 5</p>
<p><b>Prerequisites:</b> 2<sup>nd</sup> semester on the MSc in Energy Engineering, Sustainable Energy Engineering or similar</p>
<p><b>Relevant for:</b> TEPE, HYTEC, PECT</p>
<p><b>Objective:</b> Students who complete the module should have the following knowledge, skills and competence:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> <li>• Have comprehension of the aspects of integration and analysis of advanced thermal processes regarding, for example: <ul style="list-style-type: none"> <li>○ Analysis and optimisation of thermal systems using techniques such as pinch analysis and heat exchanger network synthesis using mathematical programming techniques</li> <li>○ Case: Modelling of part-load conditions in thermal systems including practical control aspects</li> <li>○ Case: Modelling and integration of advanced fuel cell systems</li> </ul> </li> <li>• Have knowledge about advanced fluid dynamical topics and system analysis of such systems related, for example: <ul style="list-style-type: none"> <li>○ Techniques involved in the design of heat/mass exchangers – shell-and-tube, plate, extended surface, evaporators, condensers, humidifiers, etc. Flow induced vibrations</li> <li>○ Two-phase fluid flow, models, boiling, condensation and instabilities</li> <li>○ Equations of State. Thermodynamic functions/properties. Maxwell's relations. Residual properties. Phase equilibrium and phase change</li> <li>○ Heat transfer by radiation. Modelling methods (<i>e.g.</i> Discrete Ordinate, Discrete Transfer, Monte-Carlo, <i>etc.</i>). Gaseous radiative properties. CFD modelling of radiative heat transfer</li> </ul> </li> </ul> <p>Skills:</p> <ul style="list-style-type: none"> <li>• Be able to identify the elements related to the control aspects of thermal systems</li> <li>• Be able to apply the knowledge gained to set up experiments on advanced fluid dynamical systems</li> <li>• Be able to apply the knowledge on advanced fluid dynamical systems related to the above topics</li> </ul> <p>Competence:</p> <ul style="list-style-type: none"> <li>• Independently be able to define and analyse scientific problems within the area of advanced thermal process systems and advanced fluid dynamical systems</li> <li>• Independently be able to be a part of professional and interdisciplinary development work within the area of thermal process systems and advanced fluid dynamical systems</li> </ul>
<p><b>Type of instruction:</b> The course is taught by a mixture of lectures, workshops, exercises, mini-projects and self-study.</p>
<p><b>Examination format:</b> Individual oral examination which will be held in accordance with the rules in the Examination Policies and Procedures, Addendum to the Framework Provision at Faculty of Engineering and Science, Aalborg University.</p>
<p><b>Evaluation criteria:</b> As stated in the Framework Provisions</p>