

**Automaatiopäivät²² 2017 Seminar Proposal:
Empowering the Learning of Energy Automation**

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ABSTRACT

There are several driving forces asking for major changes in the engineering studies of public higher education. Our working life is in a continual change. New tools of digitalization are commissioned and novel working methods are required in many kinds of engineering, development and business projects. A lot of work takes place in communication networks and cloud services. Lifelong learning will be more and more a parallel phase in careers, in its literal meaning. At the same time, learning should be easily available, more entertaining and realizable with decreasing public funding. Information flow is enormous, plagiarism is an everyday problem. More flexibility is called for in the teaching and learning arrangements of higher education. This paper will present three practical approaches how to get more efficiency in the education of energy automation. The learning experiences, advantages and limitations of used tools and methods will be discussed.

FIRSTLY, COURSES AND OTHER LEARNING EVENTS SHOULD BE ORGANIZED IN A MORE EFFECTIVE WAY. Traditional prescribed curricula in degree education make long-term frameworks for engineering studies. Today it is common in universities to make a curriculum consisting of 5 credit courses, while a course comprises 135 hours student work. A full-time student should make annually 60 credits. The contents of courses should be updated on a short-term basis, principally based on working life's and students' needs. It is very human that lecturers like independent show mastering and tend to stick to their earlier studies, experiences and materials. Why not to offer courses with more dynamic contents and varying arrangements? When a lecturer team designs and realizes together a course, a wider spectrum of expertise can be utilized, and a shorter time is needed. Why not to offer those courses in internet? All tools are available, but with some limitations. The lecturers may come from different locations, the students may join the learning sessions wherever they like. The sessions can be recorded for those ones who like to see the discussions later.

Former Kymenlaakso University of Applied Sciences (KyAMK) has been successfully running blended learning in Energy Technology with adult groups since 2009. Online lectures in internet using Adobe Connect and their recordings together with Moodle learning platform make the basis. Moodle contains schedules, instructions, course materials and submission links. KyAMK has been running a basic 5-credit course "Wind and Solar Power

Technology and Business” with Lappeenranta University of Technology since 2011. The online lecturing takes place every spring in internet using Adobe Connect or Skype Business. Year after year the contents have been updated more and more professional. In the fall 2016, a 5-credit course “Energy Production” could be offered online in internet to former Mikkeli University of Applied Sciences (MAMK), realized by three KyAMK lecturers. “Energy Production” could be created and customized to MAMK needs in a rather short time, based on earlier blended learning experiences.

SECONDLY, ALSO LABS AND WORKSHOPS COULD BE ARRANGED AS DISTANCE LEARNING.

Remote monitoring and operation are increasing also in energy production. District heating power plants in faraway geographical locations may be monitored and operated from a single central control room, while commercial wind turbines always run unmanned using remote monitoring and operation. Using common communication networks and cloud services provided by service suppliers, a remote access can easily be created to smart components. Why not to offer a remote access to some lab or workshop facilities?

Since 2015 KyAMK has been organizing small workshops with a solar thermal collector. From March to September the heat exchange of the solar collector can be monitored online in internet using the cloud services of the supplier company. Every sunny day presents a unique data set for heat exchange and energy efficiency calculations. Also the performance of the control system can be evaluated. This simple arrangement has been interesting dozens of students very much. Students may monitor the collector whenever they like and decide themselves when to sample the data for detailed calculations. The system links are available in Moodle. This solar collector facility works well both for small and large groups. It has been utilized in the learning of renewable energy and process control in different course combinations.

THIRDLY, PROJECT AND EXERCISE DOCUMENTATION MAY CONTAIN INNOVATIVE AND ENTERTAINING ELEMENTS. Increasing working with networks and databases implies advanced documentation skills. Most of engineering work must be documented and published electronically by those engineers creating the things. Documentation tools should support collaborative working.

In “Control Room Operation and Simulation” KyAMK’s students have been working out and documenting flow charts, functional loop descriptions and control logic diagrams using Moodle Wiki, a shared editor. Teams have been deciding their documentation rules and responsibilities, while every team member is editing online. This Wiki activity resembles public Wikipedia processing and is training for collaborative and responsible working, and for clear and readable documentation outlines. Also glossaries, keyword by keyword, can be collected using Moodle Glossary in a collaborative way.

Sometimes compact and rather simple documentation may be very effective. In the fall 2016, in “Renewable Energy” KyAMK’s students of Energy Technology submitted their personal study reports on the environmental impacts of energy production as PowToon animations. The animation outputs were very encouraging. Perhaps reflecting our vibrant times, many students found this kind of visual documentation very inspiring and motivating. The processing of animations is vigorous training for public, compact, visual and oral presentations, containing even creative and entertaining elements.

The authors are participating in an EU Erasmus+ development project called “Learning Toxicology through Open Educational Resources”, TOX-OER, in 2015 - 2017, aiming at a massive open online course (MOOC) material on toxicology. <https://www.powtoon.com/online-presentation/fVIXnqZLWZc/empoweringlearning/>