I. Mechanical Engineering

**Title: Renewable Energy**

Four students in Mechanical Engineering, year 3, are welcome to KTH to do a short internship. The topic of the internship is connected to a Renewable Energy Lab located at the Department of Energy Technology, KTH.

The Renewable Energy Lab consists of a small wind power plant, electrolyzer, batteries, PV-panels, fuel cells etc. Part of the system is already installed, but during the summer/fall, some new equipment will be installed and the components of the system will be integrated. The students will participate in the setup of the system, testing the system and development of labs for other students. The work will of course be supervised by a teacher at the department.

**Contact Person:**
Professor Björn Palm
Applied Thermodynamics and Refrigeration Technology Division
Title: Heterogeneous catalysis for biodiesel production

Vegetable and inedible oils similar to diesel fuel have high heating value (HHV). However, their high viscosity and density as well as low volatility make them difficult to be used directly in compression-ignition engines due to the formation of carbon deposits causing injector fouling and failure. Therefore, vegetable/inedible oils also known as triglycerides have to be converted by transesterification to biodiesel or fatty acid methyl esters (FAME) in order to find application as alternative fuel in engines. The biodiesel obtained in such a way can be used either in its pure form or may be blended with petroleum diesel in engines. The transesterification reaction (alcoholysis) of vegetable/inedible oils takes place using a short-chain alcohol (methanol or ethanol) in the presence of homogeneous (acid or basic) or heterogeneous (acid, basic or enzymatic) catalysis or non-catalytic supercritical fluids. Currently, most of the biodiesel produced on commercial basis is dependent on the homogeneous reactions of triglycerides with methanol by the alkali-catalyzed reaction according to the following consecutive scheme:

\[
\text{Triglycerides} + \text{ROH} \leftrightarrow \text{diglycerides} + \text{FAME} \\
\text{Diglycerides} + \text{ROH} \leftrightarrow \text{monoglycerides} + \text{FAME} \\
\text{Monoglycerides} + \text{ROH} \leftrightarrow \text{glycerol} + \text{FAME} 
\]

Reaction 1) requires 3 mol of methanol and one mol of triglycerides to produce 3 mol of biodiesel (FAME) and 1 mol of glycerol. However, due to the reversible reactions and formations of intermediates an excess amount of methanol is required for the forward reactions to attain high degree of conversions. The reaction is generally believed to proceed via the nucleophilic attack by the methoxide (formed from methanol and alkali hydroxide) species on a carbon atom of the carbonyl groups of the acylglycerols ensuing in the formation of methyl esters.

A new approach using heterogeneous catalysts has attracted much attention in recent years for the production of biodiesel. Many different heterogeneous catalysts have been developed and tested at the laboratory scale for the transesterification reactions. The main focus of this small project is therefore to dwell on:

1) Literature survey on heterogeneous catalytic reaction for harnessing biodiesel from vegetable oils (one week).
2) Experimental work using state-of-the-art heterogeneous catalytic materials through preparation of the active phases and study of one or two parameters depending on time and other activities and submission of the final report (two weeks).

Contact Person:
Professor Yohannes Kiros,
Department of Chemical Technology
Title: Electro-technical Modelling

One mandatory course that is given in semester 5 in the Master’s Programme in Electric Power Engineering is Electro-technical Modelling (El2433). This course comprises an introductory theory part and project work consisting of 7 projects each is to be carried out in one week. It has become rather popular, but need to be vitalized in form new projects.

The idea of the suggested project work for visiting PUA students is that they should develop more projects. A work that is to be done comparatively independent, but under supervision of experienced teachers that are engaged in the course.

Depending on the situation and project two or more students can work with the same project.

Because the idea of the course is that it should function as an appetizer regarding different topics in electro-technology the scope of variation of the projects may be big.

Contact Person:
Professor Göran Engdahl
Dept of Electromagnetic Engineering, KTH
IV. Architecture Engineering

Project Title:

**A42O1A Orientation; History, Theory and Technology of Architecture**

4:1 3.0 credits

Orientering; Arkitekturers teknik, teori och historia 4:1

**Learning outcomes**

Students who have completed this unit should be able to:

Undertake independent research to gather material on a given case study example select, from their previous knowledge and from lectures and presentations given within the course. A key area within architectural technology and/or outline a key area of consultant knowledge that is relevant in a particular case study. This selection/outlining should be made according to the broad divisions between five areas of architectural technology taught throughout the syllabus and reviewed in this course.

Outline the most important parameters that are controlled by this area of architectural technology and show the operative potential for architectural design of this knowledge in the context of the case study.

Present this argument clearly through a verbal/digital presentation with diagrams and images.

**Course main content**

The course consists of 5 lecture presentations giving placing technology withinthe history and theory of architecture. Each student attends one seminar discussing a case study example. All students produce material for a final presentation seminar.

**Disposition**

The course is based on lectures, seminars, material production and a final presentation.

**Eligibility**

Bachelor’s Degree, or an equivalent level, within the field of Architecture or a closely related field

Incoming exchange students within an architecture agreement can select this course.

No other exchange students are allowed to select this course.

Contact person:

Professor Johan Mårtelius
Department of Architecture