

Presentation Of The *Architectural Engineering And Energy Systems* Programs At University Of Applied Sciences Biberach, Germany

Tobias Leibing, LEED® AP
Prospective B.Eng. Architectural Engineering
Biberach University of Applied Sciences
Karlstraße 11
88400 Biberach, Germany

Abstract

We are a group of 10 students accompanied by 4 professors and scientific assistants from the University of Applied Sciences in Biberach, Germany. We've been invited to this conference and would like to present our university and the newly established Field of Studies "Energy & Climate" which aims to deal with the growing demand of professionals in the branch of renewable energies.

The University

The Biberach University of Applied Sciences offers the following programs to interested students:

- **Architecture**
- **Architectural Engineering & Energy Systems**
- **Civil Engineering**
- **Project Management**
- **Business Administration**
- **Pharmaceutical Biotechnology**

Because of its rather small size – 1400 students, 60 professors, 120 lecturers and 100 assistants – the atmosphere of the university can be described as personal and familiar. This fact is seen as a big potential for both the students and the tutors: comprehensive studying and mentoring by the professors is done in small groups as well as individually.

This is continuously awarded in various rankings and additionally all faculties of the university are accredited or under accreditation process. This certifies best practice in Biberach!

Besides the conveyance of engineering and scientific basics the university focuses also on soft skills like 'rhetoric' or 'methodically & scientific approaches'.

Due to the contiguousness to the 'real world' the university's programs are always up-to-date and practical related.

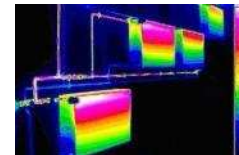
Research & Development

The Research & Development Department ensures an education close to the economy's needs with several institutes and laboratories. Thereby the institutes see themselves as a partner of industry, business and local authorities – and, at the same time as teaching platform.

For that reason the Institute of Applied Research (IAR) is the scientific institution of the university in which all research activities are bundled. There are several areas of expertise coordinated by the IAR:

- **Institute of Applied Research ***
- **Institute of Timber Construction**
- **Institute of Building & Energy Systems**
- **Institute of Geo & Environment**
- **Institute of Real Estate Economics & Project Management**
- **Institute of the Built Environment**
- **Institute of Pharmaceutical Biotechnology**

**Coordination of Institutes*



“Energy & Climate”

As a reaction on the increasing demand for qualified personnel in the topic renewable and alternative energies, the university created a new field of studies: “Energy & Climate”. When looking at the well-known energy chain of the economy one can see two major parts: the generating of energy and the use of energy.

With the Architectural Engineering and Energy Systems programs the Biberach University wants to cover the whole process from the production to the final use of energy.

Both programs require a pre-internship (2 months) and end up with the academic degree ‘Bachelor of Engineering (B.Eng.)’. After doing the bachelor program (7 semesters, incl. 1 internship) the students have the opportunity to do the master’s program which lasts 3 semesters.

Due to the nature of the content of these programs their students have both separate and common lectures.

During the first and second semester they get trained in the traditional engineering and scientific basics like fluid and thermodynamics, computing, CAD as well as math and physics. Subsequently the students focus on the energy economics and management respectively on the building technologies.

After the bachelor’s degree students are encouraged to enroll in the Master’s program (3 semesters) of the university. Its curriculum focuses strongly on scientific-methodically approaches. There are various courses, ranging from process enhancement, modeling & system theory to individual projects supervised by the professors in cooperation with the Institute of Building & Energy. The students themselves are able to set their focus within the program in current practically related projects.

Students graduate with a Master of Science (M.Sc.) and are eligible to do a Ph.D.

Energy Systems

The purpose of the Energy Systems program is to train the students the ability of designing sustainable energy systems. Thus there is a cooperation agreement with the Ulm University of Applied Sciences so students can benefit from the knowledge as well as the facilities of both institutions. Within this alliance the Biberach University covers mainly the part of the building systems whereas the Ulm University is responsible for the energy management systems.

Students of the Energy Systems thereby get a specialized education for combined heat & power technology, decentralized & renewable energies, energy management/ -contracting/ -conservation and more.

Architectural Engineering

The Architectural Engineering program wants to close the gap between the classical utility engineering, building physics and architecture. Therefore there are several courses in which the students work closely together with fellow students from the architecture program on various projects.

The Biberach University wants to bring both parts closer together and encourage the communication and cooperation between those two fields.

Furthermore students of the Architectural Engineering program get a holistic knowledge of buildings and their technical systems including the economical and ecological effects of it. Besides they become skilled at designing, constructing and operating climate adapted buildings.

To ensure all these goals the Institute of Building & Energy Systems, supported by the following laboratories, gives the students the chance of 'learning by doing' on current topics ranging from conceptual issues and research and development work to special expert opinions. The primary task of the interdisciplinary institute is thus the practical scientific training of the students.

▪ **Laboratory of Simulation Technology**

(Prof. Dr.-Ing. Koenigsdorff)

▪ **Laboratory of Hydraulics**

(Prof. Dr.-Ing. Floß)

▪ **Laboratory of Building Automation Systems**

(Prof. Dr.-Ing. Becker)

▪ **Laboratory of Ventilation & Climatic Systems**

(Prof. Dr.-Ing. Haibel)

▪ **Laboratory of Light Engineering**

(Prof. Dipl.-Phys. Gerber)

▪ **Laboratory of Applied Building Systems**

(Prof. Dr.-Ing. Koenigsdorff)

▪ **Laboratory of Electrical Engineering**

(Prof. Dr.-Ing. Kasikci)

▪ **Laboratory of Facility Management**

(Prof. Dr.-Ing. Ast)



Student Projects

All this imparted knowledge is implemented in parallel in a range of student assignments, which can be even actual projects of the ‘real world’.

Therefore after returning from their internship the students can apply the gained experience and knowledge to an own project which gives additional insight in approach, organization and successful completion of the task.

The student’s scientific work thereby is fundamental and essential when it comes to the realization of these projects.

The below listed sample projects show the variety of issues the students have to deal with:

- Development of an energy strategy for a restaurant chain
- Feasibility study of a local independent heating system for a village
- Development of system solutions to achieve low-energy-standards with focus on renewable technologies

One **project of particular interest** which I personally worked on was the ‘Analysis and Optimization of a health center with a thermal spa’.



The scope of work in this task was divided into two separate assignments:

1. Breakdown of the energy distributing system for electricity and heating
2. Analysis of the air handling units serving the indoor swimming pool of the thermal spa

Approach

The first step in this project was to collect all the available and relevant information regarding the energy system and the specific air handling units. Therefore we made an on-site inspection including photo documentary and evaluating all the revision documents.

Because this data was not sufficient enough to make a declaration about the actual situation of the property and since there was no building automation system existent, we tried to get the necessary numbers by taking the required measurements ourselves. Here we were able to use the measurement equipment of the university’s Laboratory of Ventilation & Climate Systems. In view of the fact that humidity control is crucial within the pool house to prevent both complaints of the customers and structural damage we focused on how flexible these criteria were and how various changes affected the operating costs of the property. Furthermore we were

capable to assign the different energy fluxes to the corresponding buildings respectively technical systems.

Result

As an outcome of our work we were able to provide the client with up-to-date schematics of the energy distribution systems and in addition we discovered that the air handling units were strongly oversized.

Thus the cooperation of the client with Biberach University will be continued and following semesters are going to investigate other parts of the property.

Conclusion

Since the market for renewable energies and alternative energy concepts is rapidly growing, the University of Applied Sciences Biberach is taking the lead in providing the demanded personnel and is also making great efforts in Research & Development as well as in standardization activities.

Due to the fundamental and comprehensive education of the Biberach University of Applied Sciences graduates usually don't have any problems in finding a suitable and attractive job. Possible job descriptions and employers for energy systems students are industrial energy management, energy trade or energy supply companies. Architectural engineering students often work as consulting engineers, in the HVAC-R and solar energy design or in the Facility Management.

Further information:

www.hochschule-biberach.de

