

## **KURSRAPPORT      vår 2011**

AAR 4926

M. Sc. Sustainable Architecture

Integrated energy design - Energy systems and services and their integration in architectural design (theory)

Studiepoeng:            7,5 stp  
Emneansvarlig:        Førsteamanuensis Matthias Haase  
Referansegruppe:     all students

Gjennomført evalueringsmøte1      dato: 24.01.2011  
Gjennomført evalueringsmøte2      dato: 11.02.2011

## **Course content**

Energy systems and services and their integration in architecture. Solar energy. Challenges related to the renovation of existing buildings and cultural heritage. Design and evaluation tools. Integrated design methodology. Co-operation with the Faculty of Engineering Sciences and Technology.

### Learning Aims

- Learn to integrate energy systems in architectural design
- Practice the interdisciplinary procedures necessary to ensure a successful functioning of these systems in architecture.

### Therefore

- The students design a range of projects with focus on integrated energy design and interdisciplinary co-operation between building professionals.
- Both domestic and non-domestic buildings are addressed, as well as new and existing building structures.

### Activities

- Design studio guidance and presentations; exercises and lectures; site visits
- Case studies; research articles and other literature; lecture notes; site visits

## **Assignments**

- Assignment 1, Case study; find the energy concepts of 3 projects and analyze them
- Assignment 2, Discuss and develop alternative energy concepts, make plan for follow-up (in co-operation with the Faculty of Engineering Sciences and Technology, Climate technology course, Prof. Mathisen)
- Assignment 3, Updated energy concepts, quality control plan

## **Lectures**

- Integrated Design Process - Per Monsen
- Integrated Energy Design – Matthias Haase
- Heat transfer in building components and assemblies – Arild Gustavsen
- Half day Lighting seminar – Matthias Haase (4 lectures)
- Half day Ventilation seminar – Hans Martin Mathiesen (3 lectures and lab visit)
- Energy calculation and documentation – Matthias Haase
- Heating cooling and domestic hot water seminar – Vojislav Novakovic (3 lectures)
- Solar Energy supply – Matthias Haase

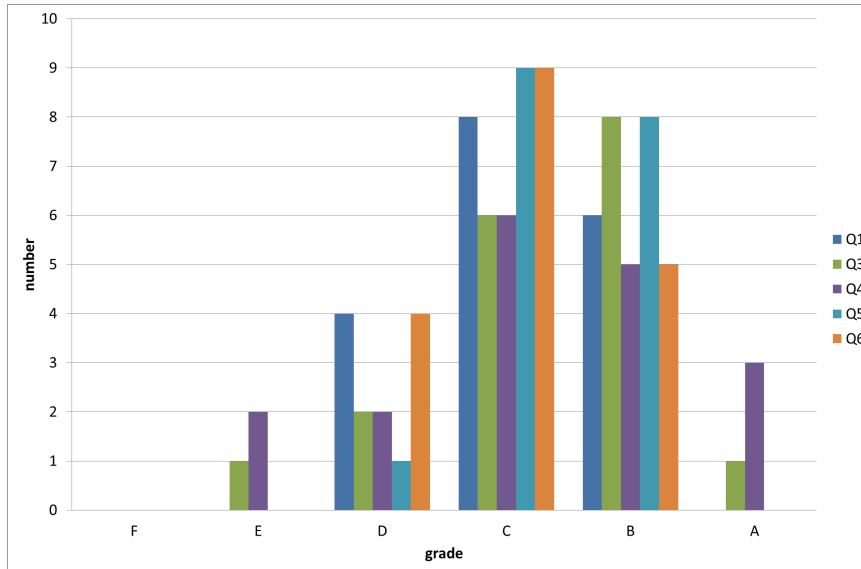
## **Examen**

Written

## Characters

F	0
E	0
D	1
C	11
B	6
A	0

## Distribution of the different answers



## Evaluation

### *Assignments*

All in all did it work fine.

Additional Comments from the teacher

Need for a closer connection between compendium and lectures. If the compendium is not actively used during the lectures, the students tend to wait too long before reading and studying it. This lowers their performance on the written exam, and it reduces the opportunity of integrating this knowledge into the project design during the semester.

Need for more reflection about principles, tools and strategies used in the project course (again, link between theory and practice). When we include a question in the written exam about the principles the students have been working with during the project, few are able to discuss and reflect upon their own practice (at least not within a 4-hour written exam).

During the exam, students often state THAT something is important, but have more difficulties in explaining HOW one can integrate these issues into design.

### *Tverrfaglige samarbeid*

Samspill med Fakultet IVT fungerte bra. Studenter i lagene spilte ikke helt sammen men det er naturlig. Vi må jobbe mer med dette.

Prof. Mathisen: "Jeg synes studentenes presentasjoner var bra, dvs. at gruppene så ut til å ha gjort et grundig arbeid. Skal bli spennende å se rapportene.

*Snakket litt med noen av studentene fra Klimateknikk etterpå. De synes nok at det var for knapp tid for oppgaven, slik at en stor del av tiden hadde gått med til å forstå problemstillingen og å bli enige om hva de skulle gjøre. De sa også at slike grupper trenger litt mer tid til å "sosialisere seg" for å få til god kommunikasjon og å kunne jobbe effektivt sammen. Bortsett fra det sa de også at de hadde opplevde gruppearbeidet som lærerikt.*

*Når det gjelder fortsettelsen av øvingsarbeidet for Klimateknikkstudentene så ga de uttrykk for at de foretrekker å skifte over til Linesøya-bygningen. Så det har vi besluttet å gjøre. Kommer til å bruke det underlaget som jeg fikk fra deg."*

Videre samarbeid mellom de to fagene er ønskelig. Må avklares EIT deltakelse.

### *Klimatekniske studenter evaluering*

ZE-hytte prosjektet vakte en del frustrasjon på grunn av det å bli kastet rett ut i det. Samtidig var oppgaven nokså uklar og skapte litt usikkerhet hos studentene. Likevel kan det være sundt å bli kastet ut i det med en tverrfaglig gruppe, men oppgaven bør være klarere definert. Oppgaven bør også stå i forhold til kunnskapsnivå.

### *Master student evaluation*

#### 110124 Teacher-Student meeting (all students)

- From Spring 2011, the teacher group will decide on the grades, including all who gave guidance, not only the responsible teacher and the external reviewer
- The teacher group will create clear learning aims for each project, assignment and course, making it more clear which expectations they have regarding the students' work
- Make a reference group of students with different educational and geographic background. Due to the varied nature of the master programme, it's better to have more than 2-3 students.
- Starting off with a small excursion or common activity, easier to get to know each other
- Each project, exercise etc should get specific feedback
- As much as possible, provide a detailed plan for entire semester, not on a weekly basis
- Need for more feedback from the ECOTECT-exercises, evaluation for the entire class, what can we learn for next time, what can we learn from others?
- The software is not always reliable; you always have to be critical about the results and methods.
- ECOTECT-exercises need to be passed, but do not contribute to the final grade
- The exam questions of previous semesters will be handed out, but not the answers.

### 110211 Teacher – Student Meeting

- The project starts in parallel with the lectures, this can make it more difficult to start the project right away for the students with less background (e.g., only BSc). Might be made easier through some introductory assignments (fx case studies) to prepare for the upcoming design project?
- Ideally, post the lectures and relevant literature about 1 week prior to the lecture, so the students can prepare. This may make it easier for them to ask questions during the lecture, as they will have a better understanding of the topic.
- When individual lectures are given by a variety of experts, it may be a bit difficult to see the correlation between them. Is it possible to arrange an introductory lecture / group discussion to make the relation between the different lectures and lecturers more clear?

### **Examen**

Vanskelig, oppgave 2 ble ikke behandlet i semesteret (men i høstsemesteret)

We should evaluate to ask calculation questions. The use of calculators should then be allowed in the examen.

**KURSRAPPORT**      **vår 2011**

AAR 4616

M. Sc. Sustainable Architecture

Integrated energy design - (project)

Studiepoeng:            15 stp  
Emneansvarlig:        Førsteamanuensis Matthias Haase  
Referansegruppe:     all students

Gjennomført evalueringsmøte1      dato: 24.01.2011  
Gjennomført evalueringsmøte2      dato: 11.02.2011

## **Course content**

The students design a range of projects with focus on integrated energy design and interdisciplinary cooperation between building professionals. Both domestic and non-domestic buildings are addressed, as well as new and existing building structures. Co-operation with the Faculty of Engineering Sciences and Technology.

### Learning Aims

- Learn to integrate energy systems in architectural design
- Practice the interdisciplinary procedures necessary to ensure a successful functioning of these systems in architecture.

### Therefore

- The students design a range of projects with focus on integrated energy design and interdisciplinary co-operation between building professionals.
- Both domestic and non-domestic buildings are addressed, as well as new and existing building structures.

### Activities

- Design studio guidance and presentations; exercises and lectures; site visits
- Case studies; research articles and other literature; lecture notes; site visits

## **Design projects**

- Project 1, Energy optimized design of the SDE building
- Project 2, Linesøya – renovation of an old school building to passive house standard
- Project 3, Refurbishment of a fire station in Surnadalsøra, taking Urban revitalization into account

## **Seminar**

### Passive house seminar:

- Passive house – history and concept - Matthias Haase
- Passive house standard: architectural limitations and possibilities - Anouk Taeymans
- Construction details in highly insulated walls - Prof. Stig Geving
- Passive house users - Løvåshagen case - Solvår Wågø
- Passive house examples - Per Knudsen

### Linesøya seminar:

- Energy and Architecture – Matthias Haase
- LiPa Environmental center – Thomas Flower Ellis
- Linesøya and other works – Sverre Andreassen, Eggen Architects

### Interdisciplinary seminar:

Tobias Fiedler from Transsolar wednesday 4.5. in co-operation with ARK6

0915 lecture in S2: High comfort – Low impact form [www.transsolar.com](http://www.transsolar.com)  
from 1130 project discussions in the studio ARK6 ROTOR

TRANSSOLAR is a climate engineering firm whose scope is to ensure the highest possible comfort in the built environment with the lowest possible impact on the environment. This is accomplished by developing and validating climate and energy concepts through the recognition that environmental conditions are influenced by all aspects and stages of design.

### **Group characters**

F	0
E	0
D	0
C	2
B	2
A	0

### **Evaluation**

#### Teachers group

There were only few teachers available for the weekly guidance. Next year this should be planned better and made aware to the team that everyone has to participate in the weekly guidance. We decided to hire Anouk Taeymans as a teacher and she was very good. The students appreciated her guidance and input in the various stages of the projects. But it did cost a lot of extra money that we should try to avoid next time.

In order to deepen the energy aspects, teachers from the Engineering faculty should ideally also be available for guidance during periods.

#### Students groups

We decided to change the groups for each of the projects. Some groups did not work well. Annemie spent a lot of time to reconcile the groups. Next year a dedicated course/seminar on group dynamics should be integrated.

#### Seminars

All three seminars did work well. The passive house seminar was very successful and will be considered to turn into a book next semester. The Linesøya seminar was meant as an introduction into the design project and has to be seen in connection with the excursion to Linesøya (see Excursion further down).



## Tools

Ecotect is an early design tool. When it comes to refurbishment and passive house design, it reaches its limits of usefulness. PHPP was used at the end of the semester. A more focused use of PHPP and more resources on teaching should be considered. Other tools should be evaluated that could be used for these tasks.

## Excursions

### Linesøya

2 days trip with stay in Stokkøya Sjøsen (28. feb – 1. mar). Site visit of school building in Linesøya with building and site analysis, blower door test.

The results of the design project were exhibited in the 2. floor, central building, ntnu as part of the European Solar Days 2011.

### Surnadalsøra

1 week design competition in Surnadalsøra with stay in block houses (from 16. - 20. may). This was planned in cooperation with student groups from Italy and Cardiff, Wales but both groups had to cancel their trip.

It was nevertheless a great success with the help of the local supporters and the communal municipality. The results will be exhibited in Surnadalsøra in autumn 2011.

### Berg studentby

Half day site visit. Access to the flats was not given.

### Skanska Housing factory Steinkjer

One day trip (28. apr) to Skanskas factory was good. It gave valuable insight in construction details and prefabrication practice.

## Student evaluation

### 110124 Teacher-Student meeting (all students)

- There is no statistical distribution of grades within one course, the average grade may be higher or lower than the Gauss curve.
- Surprise effect: the students get quite positive feedback during presentations, but have relatively low grades (e.g., C). Difficult to know what exactly went wrong if the teachers aren't more strict during mid-term presentations.
- Grades are given according to process and project, not only end result
- When several groups get various assignments, they should be judged on that assignment, not on the overall project (not everyone worked on every aspect)
- All teachers participate in grading, not only responsible course teacher and external reviewer
- Difficult to have an adjunct professor who is present on few occasions, giving feedback and setting grades. Why are the local teachers not more involved?
- Sometimes the advice is a bit contradictory, from different teachers. The students aren't sure how to respond to this.
- Make sure all teachers (particularly those who decide on grades) know all the details of the project, which decisions are made and why?

- In large groups, 5 people each, the students need to make lots of compromises – is it possible to try some additional process guidance in design studio? “Experts in Team” kind of guidance

#### 110211 Teacher – Student Meeting

- Project groups consist of students with different experience and professional background. Often it is only the strongest persons in the group who decide on the design of the project, due to limited time. This gives all people in the group higher grades, but decreases the learning of the students. When paired with students that have a similar competency, they are more able to solve problems by themselves, and make mistakes and learn from them. When working individually, there is no one to discuss with. It is better to have lower grades, but better learning.
- Often difficult (or no) co-operation in the group, due to various dimensions: disciplines, experience, culture etc. Need for guidance on group processes
- More mid-term presentations where groups can learn from each other
- The project starts in parallel with the lectures, this can make it more difficult to start the project right away for the students with less background (e.g., only BSc). Might be made easier through some introductory assignments (fx case studies) to prepare for the upcoming design project?

#### **Economy (together with theory course)**

Due to two excursions and the inclusion of an hourly paid teacher the course expenses were 50000NOK above the budget (for both courses). A financial support application over 90000 NOK was sent to Husbanken in April 2011 and was accepted in July 2011. The rest of the money will be spent on next years excursions, project report publication and conference participation.