KTH Architecture and the Built Environment

AF2025 Architectural Engineering Project 7,5 credits Autumn 2018

Course content

The course contains the planning and design of a building, the analysis and evaluation of technical solutions with a certain focus on sustainability and environmental effects.

Aim

The aim is to develop the skills to analyse and evaluate technical components and systems as well as the ability to present technical solutions in drawings and the ability to present and motivate the choice of technical solutions orally and in writing.

The technical solution must consider

- The cost of operation and maintenance with a certain focus on energy consumption and Global Warming Potential emissions.
- Durability, with a certain focus on moisture problems.
- Aspects of performance related to building physics, heat transfer and moisture transport.

The performance of the building components and the building as a system are to be evaluated through calculations and simulations and the results should be compared to the building code as well as the "state of the art".

Furthermore the student should to in-depth theoretical studies of a chosen theme that should be based on the scientific literature and selected reference objects.

Course activities – teaching and learning

The course is based on a collaborative project work. The project task is based on a practical-like situation and the theme for this year (2018) is residential housing based in a specific detailed plan of Norra Djurgårdsstaden Stockholm. The project task is to perform a pre-study of this project, developing a digital 3D-model that meets the requirements in the program including the high sustainability ambitions.
In order to develop the project within realistic boundaries and to present a realistic proposal, you will work together – interdisciplinary – in teams with students from Construction Project Management (CPM) and you will also have the opportunity to consult and collaborate with students from the school of Architecture (A).

The teaching and learning is based on study visits, lectures, labs and workshops where the teaching team and invited specialists provide consultation. However, the most important part of the project is the team project work where ideas are developed, tested, evaluated and documented.

The collaboration project work schedule

Thu November 1st

10-12* Projekthallen: Brinellvägen 23, CPM+AE (Teachers MH, HL, KG, AS)

Course introduction. Introduction to the project task. Creation of project teams (CPM + AE).

13 -17* Site visit Norra Djurgårdsstaden

Thematic site study according to assignment

Deliverable to be produced: **Power Point slides (2-3)**

Tue November 6th

8-10 Projekthallen, CPM + AE (Teachers MH, HL, KG, AS)

Short presentation of the site study. Introduction to research task related to Construction Management and Architectural Engineering and Sustainability for NDS.

14-18 Workshop – Development of a project vision within the project team,

Deliverable to be produced: **Draft Project Vision.**

Thu November 8th

10-12* Projekthallen, CPM + AE

Lecture Axel Sirén, architect – To draw a house

14-18 Lecture on tools – City planner (VT)

Workshop – Develop the project proposal

Tue November 13th

9-10 Projekthallen, CPM + AE

Lecture Per Franson, Dept. of Architecture

13-17 Workshop - Reformulate the vision into a design concept

Deliverable to be produced: **Design concept with key performance indicators (KPI)**

Thu November 15th

10-12 Projekthallen, CPM + AE

Lecture Axel Sirén

13-17* Workshop with Axel Sirén – **bring last week's deliverables (KPI)**

Tue November 20th

9-10 Projekthallen, CPM + AE

Lecture on BIM tools – (VT)

13-17 Workshop – continue to develop the project

Thu November 22nd

10-12 Projekthallen, CPM + AE

Preparation for next week's collaboration

13-17 Workshop –preparation for next week's workshop with students from A, develop a model for the project.

Deliverable to be produced: **Draft project proposal with draft concept (model, sketches, drawings)**

Tue November 27th

9-10 Projekthallen, CPM + AE

Lecture Per Franson, Dept. of Architecture

Preparation for the afternoon's workshop

13-17 (19)* Lounge Teknikringen 10b

Workshop with students from A – Present Background, Vision, Work process and project proposal (CPM + AE + A)

Thu November 29th

10-12 Projekthallen, CPM + AE

Q&A

13-17 Workshop – follow-up last week's workshop.

Reformulate the vision into a design concept based on last workshop's discussions – what have we learned and how will that influence the development of the project?

Tue December 4th

8-10 Projekthallen, CPM + AE

Q&A

13-17 Workshop – continue the work

Reformulate the vision into a design concept based on last workshop's discussions – what have we learned and how will that influence the development of the project?

Thu December 6th

10-12 Projekthallen, CPM + AE

Lecture on the project report

13-17 Workshop – continue the work

Tue December 11th

8-10 Projekthallen, CPM + AE

Q&A

13 -17 Workshop – work on the project report/presentation

Thu December 13th

10-12 Projekthallen **Presentations session 1**

13 -17 Projekthallen **Presentations session 2 and 3 (if needed)**

January 10th Deadline for the final report

Project task

The task in the course is to develop the project and present a pre-study report at the end of the course. The project in focus this year is presented in detail in the “project description” found in “Canvas”.

The Architectural Engineering Assignments

The assignment is to develop a new and unique concept in collaboration with the students in Construction Project Management (and partly also the students in Architecture).

Furthermore, the Architectural Engineering assignment is to develop technical solutions that regard durability and energy issues while bearing in mind the sustainability and economy of the project. The results will be presented with drawings and in text. The results will also be presented at a seminar.

Energy use and Environmental issues

Calculate the Global Warming Potential, GWP, and embodied Energy of a selected number of materials and components by using their Environmental Product Declarations, EPDs or a database of choice. Illustrate the influence of different parameters in a diagram and the potential of improvement for a selected number of parameters.

Evaluate the energy consumption of the building and compare it with the building code and “state of the art” in Sweden. Discuss the possibilities to reduce energy use and the influence of different parameters on the energy use and possible ways of meeting the energy demand of the building.

Investigate the greatest or most interesting potential for improvement of your building and the possible means to achieve these improvements. On the basis of your arguments a theme for in-depth studies is to be selected. This should be illustrated by examples of previous applications in buildings and supported by theoretical work from the literature. On the basis of this, a technical solution of interest is to be chosen and implemented in your design.

Examples:

Solar radiation, solar height, solar energy contribution and solar shading

Green roofs, energy balance, rainwater

Shape, placement of building and orientation

Seasonal design of buildings

Energy sources and energy quality

Results from workshops

Discuss the lessons learned from the workshops and what influence they have had on the project.

Drawings

The following models and drawings are to be delivered.

Representative sections on the scale 1:50

Selected detailing on the scale of 1:10 (about 5-6)

Site plan 1:400

Facades on the scales of 1:50

A section on the scale of 1:400, as necessary

Floor plan on the scale of 1:50

Illustrations, as necessary

Presentation

The project must be presented with ppt-slides containing text, figures and drawings. This includes drawings, diagrams illustrating selected results from parametric analysis.

The technical solutions must be explained and argued for in a brief text.

The in-depth studies must be presented, with a brief introduction, illustrations of reference building and the technical solutions that are implemented.

The project will be presented orally at a final seminar attended by the teachers and the other students. The teachers and the other students will then be given the opportunity to ask questions.

Oral presentation

The projects are to be presented orally at a date according to course schedule. The time frame of the presentation is as described by information given during the course.

Report

The students are to deliver a final report. The report must contain an introduction that describes the background of the assignment and a brief description of the analytical methods that were used. The main conclusions and results are to be described and the technical solutions are to be argued for, while bearing in mind the architectural context and the economy of the project.

The rapport must have a list of references.

The calculations and other working material are to be enclosed in an appendix.

The deadline of the report is January 10th 2019

Individual reflection assignment (deadline January 10th 2019)

Each student should produce a document of maximum 2 pages (minimum 1 page) containing a brief reflection on the team work process and lessons learned regarding this exercise.

What does it mean to work in interdisciplinary teams - how has it worked for your group and for you personally? What were the conflicting/agreeing views within and/or across the disciplines, what are the pitfalls and opportunities of working in such teams and what are the implications for project communication?

Litterature and important documents

Constructing Architecture, Andrea Deplazes, some exampels are to be found in ”projekthallen”. Selected articles and references may be distribited during the course.

Selected handouts during the course.

Examiners and teachers

AE	Kjartan Gudmundsson (KG) , examiner, kjartan@byv.kth.se
	Axel Sirén (AS),
CPM	Malena Havenvid (MH), examiner, havenvid@kth.se
	Hannes Lindblad (HLb), Hannes.Lindblad@abe.kth.se
	Väino Tarandi, professor (VT), vaino.tarandi@abe.kth.se
A	Per Franson, per.franson@arch.kth.se

Evaluation and grades

The students are required to be present at no less than 80% of the lectures and seminars marked with an asterix,*.

Grading criteria

1. Sustainability

E The project includes an in-depth literature study, based on articles from scientific journals, with a theme of own choice related to energy savings in buildings, energy quality or environmental impact.

C The relevance of in depth study to own project is clearly described.

A The in depth study is implemented in the project

2. Building Technology and detailing

E Technical detailing and drawings, drafted in cad. The quality and dimension of all materials are specified. Technical solutions are argued for in terms of risks related to moisture diffusion, capillary transport, air tightness and thermal bridges.

C Technical solutions are verified through calculation of risk of condensation and high relative humidity in the construction.

A The solutions are strongly argued for by comparison of alternative technical solutions. Drafting according to standard.

3. The energy consumption of the building

E The most important factors related to the energy use of the building are discussed.

C An estimation of the energy demand of the building.

A Technical solutions for meeting the energy demand are suggested and discussed in terms of sustainability

4. The influence of different parameters on energy consumption

E the Influence of some parameters (2 or more) is investigated and discussed

C The influence of a number (3 or more) of parameters is compared in diagrams and discussed

5. The influence of different parameters on GWP

E the Influence of some parameters (2 or more) is investigated and discussed

C The influence of a number (3 or more) of parameters is compared in diagrams and discussed

A The results of the parametric analysis is used to develop the concept further

6. ***The developing and presentation of an attractive concept and strategy based on sustainable solutions***

E To develop and present an own project

C To develop and present a project, explaining how the approach relates to sustainable solutions

A A project with a strategy that is related to several aspects of sustainability.

7. The ability to work in a team

E Active participation in group work and some ability to reflect on that participation.

A Ability to reflect on group work in terms of the working process and the roles of different team members.

8. ***The ability to discuss the technical solutions and concepts***

E Active participation in seminars and presentation at final seminar

C A final presentation that clearly describes the project.

A Very good final oral presentation that clearly describes the project, the aims of the project and the means to reach those aims.

The final grade is obtained as follows

E	at least E on all criteria
D	at least E and at least C on 4 out of 8 criteria
C	at least C on all criteria
B	no less than C on any criterion and no less than A on 4 criteria
A	no less than A on all criteria

Disability

Support via Funka
If you have a disability, you may receive support from Funka.
https://www.kth.se/en/student/studentliv/funktionsnedsattning

Inform the teacher
We recommend you inform the teacher regarding any need you may have. Funka does not automatically inform the teacher.

Other facts

We recommend you to visit KTH´s student web – yttp://www.kth.se/student – to read about the general policy that is applied at KTH. There you can find important information about ”The rights and the obligations of the students”, ”functional disability”, ”examination rules” etc.