KTH Architecture and the Built Environment

AF2025 Architectural Engineering Project 7,5 credits Autumn 2020

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 make a project proposal for a building that takes into account the different aspects of sustainability.

Furthermore, the aim is to develop the skills to analyse and evaluate the technical components of a building considering the energy consumption and Global Warming Potential emissions as well as durability.

The ability to present technical solutions in drawing and the ability to present and motivate the choice of technical solutions orally and in writing is important aspect.

Course activities – teaching and learning

The course is based on collaborative project work. The course will be taught in a digital format through Zoom but the project teams will be free to meet physically, and there will be available rooms for teamwork. The project task is based on a practical-like situation and the theme for this year (2020) is residential housing in Krokek, Norrköping. The project task is to perform a pre-study of this project 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 have the opportunity to consult and collaborate with students from the school of Architecture (A).

The teaching and learning is based on lectures, labs and workshops in digital format (Zoom) where the teaching team and invited specialists provide consultation. However, the most important part of the course is the collaborative work in the project teams where ideas are developed, tested, evaluated and documented.

Work schedule (observe the starting hour of each lecture/workshop as it varies)

Active presence is mandatory at minimum 80 % of the lectures/workshops marked with "" in the schedule.*

Date	Time	Place	Content	Delivery to be produced	Participation	Teachers
w.44						
Tue 27/10	**9:00-10:00**	ZOOM	Course introduction: structure of course, learning goals, project task		CPM+AE	KG MH
	13-17*	ZOOM	<u>Common intro:</u> regarding the mutual project part with the A-students A-students present their visit to the site		CPM+AE+A	KG MH PF RM
Thu 29/10	10-12*	ZOOM	Lecture: project vision and sustainability related to the project Workshop: Developing a first project vision	First draft of project vision	CPM+AE	KG MH
	13-17*	ZOOM	Workshop: working on different themes based on sustainability	Presentation of the sustainability themes	CPM+AE	KG MH
w. 45						
Tue 3/11	9:00-10	ZOOM	Guest lectures on wood and windows: *Pilkington*		CPM+AE+A	KG MH PF RM
	14:00-18*	ZOOM	Guest lectures on wood and windows: *Hajom* Windows in wood constructions (PF)		CPM+AE+A	KG MH PF RM
Thu 5/11	10-12	ZOOM	Lecture: GWP and environmental aspects - digital tools for energy use		CPM+AE+A	KG
	14-18	ZOOM	Lecture 1: urban daylight Lecture 2: the window		CPM+AE+A	RM PF MH

			Lecture 3: understanding the market/users *First meet and greet in the groups*			
w. 46						
Tue 10/11	9-10	ZOOM	The business aspect of housing development and using KPIs		CPM+AE+A	MH
	13-17*	ZOOM	<u>Common workshop 1:</u> reformulate the vision into a design concept with KPIs (students bring their respective work/sketches into the common project group)	Design concept with key performance indicators (KPI)	CPM+AE+A	KG MH PF RM
Thu 12/11	10-12	ZOOM	Lecture: measuring daylight		CPM+AE+A	RM
	13-17*	ZOOM	<u>Common workshop 2:</u> developing sketches of building, floor plan and section	Sketch of building, floor plan and section	CPM+AE+A	KG MH PF RM
w. 47						
Tue 17/11	9-10	ZOOM	Lecture: The energy balance of a window		CPM+AE+A	KG
	13-17*	ZOOM	<u>Common workshop 3:</u> continue the work on sketches and calculation of building, floor plan and section	Continue sketch of building, floor plan and section	CPM+AE+A	KG MH PF RM
Thu 19/11	10-12	ZOOM	Workshop and possibility for group debriefing with KG and MH		CPM+AE	KG MH
	13-17*	ZOOM	<u>Common workshop 4:</u> preparing for the common poster presentation: vision, sketches, calculations etc.		CPM+AE+A	KG MH PF RM
w. 48						
Tue 24/11	8-10	ZOOM	Preparing presentation	Draft project report with draft concept for supervision	CPM+AE+A	KG MH PF RM

	13-17*	ZOOM	<u>Common poster presentation:</u> Design of Building - 1 view / Floorplan/Situation Energy calculations – Charts/Diagrams Daylight modelling – KPIs	Poster presentation	CPM+AE+A	KG MH PF RM
Thu 26/11	10-12	ZOOM	Workshop: continue the work *Supervision of draft report*		CPM+AE	KG MH
	13-17*	ZOOM	Workshop: continue the work *Supervision of draft report*		CPM+AE	KG MH
w. 49						
Tue 1/12	9-10	ZOOM	Lecture on the final report		CPM+AE	KG MH
	13-17*	ZOOM	Workshop: continue the work		CPM+AE	KG MH
Thu 3/12	10-12	ZOOM	Q&A		CPM+AE	KG MH
	13-17	ZOOM	Workshop: work on report/presentation		CPM+AE	KG MH
w. 50						
Tue 8/12	8-10	ZOOM	Work on report and prepare presentation			
	13-17	ZOOM	Work on report and prepare presentation			
Thu 10/12	10-12*	ZOOM	Final presentation session 1		CPM+AE	KG MH
	13-17*	ZOOM	Final presentation sessions 2 and 3		CPM+AE	KG MH
w. 1 2021						
11/1			Final hand-in report and individual reflection			

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 and the report

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 good technical solutions while bearing in mind the sustainability and economy of the project.

The results will be presented in 1) a poster presentation produced jointly with the Architectural engineering and Architecture students, 2) a report produced jointly with the Construction Project Management students, and 3) an oral presentation at a final seminar in appropriate format (ppt-slides).

The report (deadline January **11th 2021**) shall be in written format and contain:

- A brief summary of the task and a general description of the project. You can use output from the workshops to argue for the overall aims of the project. Describe how your common ambitions across the different disciplines (student groups) with the project are translated into common and specific aspects of the result. It is recommended that you show pictures of the area and the proposed building as well as floor plans.
- Describe in a short text the ambitions of the municipality regarding sustainability and explain how this relates to your choices in the project.
- Floor plan on the scale of 1:50 should be enclosed in the appendix of the report. Representative sections on the scale 1:50 should also be included in the appendix. You are free to choose between the use of 3D illustrations or 2D façade drawings to illustrate the building (façade drawings, scale of 1:50, should be put in the appendix of the report).
- There should be a chapter on building technology and detailing in which you briefly explain your technical solutions for the façade and motivate your choice of solution. Details on the scale of 1:10 showing window, wall and floor slab are mandatory and should be put in the appendix of the report.
- Estimate the energy use 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 – with emphasis on heat loss through the windows. Discuss possible ways of meeting the energy demand of the building.
- Calculate the Global Warming Potential, GWP, and embodied Energy per square meter wall 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.

Posters

The project must be presented on posters that will be done in cooperation 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).

Oral presentation

The project will be presented orally at a final seminar attended by the teachers and the other students at a date according to course schedule. The teachers and the other students will then be given the opportunity to ask questions. The time frame of the presentation is as described by information given during the course. This should be done using ppt-slides containing text and selected figures, drawings and results that give a good overview of the project. The presentation should argue for the choice of technical solutions in the project.

Individual reflection assignment (deadline January 11th 2020)

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. The following discussion points must be included:

- What does it mean to work in integrated professional teams? How has it worked for your group and for you personally?
- What were the conflicting and agreeing views within and/or across the disciplines? Why so?
- What are the pitfalls/opportunities and strengths/weaknesses of working in such teams, and why?
- What could be methods of overcoming weaknesses and fortifying strengths of and within integrated professional teams?

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 through Canvas during the course.

Examiners and teachers

AE	Kjartan Gudmundsson (KG) , course responsible, kjartan@byv.kth.se
	Folke Björk (FB), examiner, folkeb@kth.se
	Axel Sirén (AS)
CPM	Malena Havenvid (MH), examiner, havenvid@kth.se
A	Per Franson (PF) , per.franson@arch.kth.se Rodrigo Muro (RM) rodrigo.muro@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. ***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.

2. Building Technology and detailing

E Technical detailing and drawings of a section of the building, drafted in cad. The quality and dimension of all materials are specified. Technical solutions are argued for in terms of risks of excessive moisture and thermal bridges.

C The solutions are argued for by comparison of alternative technical solutions.

A Technical solutions are verified through calculation of risk of high relative humidity in the construction.

3. The energy consumption of the building

E A target value for specific energy use is proposed and the most important factors related to the energy use of the building are discussed.

C A calculated estimation of the energy demand of the building is presented

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

4. The influence of design choice on energy consumption

E The U-value of a window is calculated and the effect on the total heat loss of the building is estimated and discussed.

C Several alternative options concerning the window design of the building are discussed

A The effect of window design on the transmission of visible light and lighting is discussed

5. The influence of different parameters on GWP

E The GWP of the wall design is calculated (CO_2 eq. per sqm.)

C The influence of material choice on the total GWP of the wall is compared in diagrams illustrating the impact of the different materials.

A The results of the parametric analysis are discussed and used to further develop the design.

6. The ability to work in a team

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

A Good ability to reflect on group work in terms of the working process and the roles of different team members as per description of individual reflection assignment.

7. 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 3 out of 7 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.