Bachelor's Degree Programme in Architectural Technology and Construction Management
VIA University College

SEMESTER SYLLABUS

SEMESTER 5, ARCHITECTURAL TECHNOLOGY RENOVATION

Bachelor's Degree Programme in Architectural Technology and Construction Management
VIA University College
Valid for February 2020 admission

CONTENTS

WELCOME TO SEMESTER 5, ARCHITECTURAL TECHNOLOGY

You are about to embark on the last semester in the learning environment we call 'Professionalization', and the last semester to be primarily teacher-led. You should consider whether there are any areas in which you need to make a special effort to improve your skills before you go on internship, work on the local subject elements, do your Bachelor's project and, ultimately, venture out into the labour market.

This fifth semester comprises one National subject element and two local subject elements. The National subject element deals with 'Renovation'. You will work on an interdisciplinary project in which you and your group will learn about recording and assessing existing conditions, planning, structures, materials and principles of building physics from a renovation point of view.

The semester's National subject element carries 15 ECTS credits and includes the following subject areas:
- Production 5 ECTS credits
- Structural Design 10 ECTS credits

In addition to the National subject element, this semester includes two local subject elements in which you will work on elective topics. Your work must be based on a scientifically based method, which you were introduced to earlier in the programme. You must describe a specific issue in building renovation and conversion, which you will investigate and propose one or more solutions to.

The semester's local subject elements carry 15 ECTS credits and include:
- the elective study element (EPE), which carries 10 ECTS credits and is to be undertaken as a continuation of the compulsory study element;
- the local study element (LPE), which carries 5 ECTS credits and is to be undertaken in connection with the National subject element.

The choice of local subject elements gives you considerable scope to target your training towards the work you want to do in future.

The semester timetable will be reviewed at the beginning of the semester. The indicative timetable will then be available on Itslearning.

In the course of this semester, you must look for, and find, a internship position for your sixth semester.

Student Council
At VIA, there is one combined Student Council per campus, with class representatives from across the programmes. There is also a local Student Council for the Architectural Technology and Construction Management programme, known as the Architectural Technology Student Council. Management at VIA Built Environment in Horsens, Aarhus and Holstebro continually involve their respective local Architectural Technology Student Councils in discussions on the quality assurance and quality development of the programme, including: employer involvement, graduate involvement, final evaluation of teaching, final evaluation of internships in Denmark and abroad, final evaluation of study visits abroad, the learning barometer survey and dropout analysis.

Quality assurance
As a student, you are expected to play an active part in quality assurance procedures on the programme. Among other things, this means that you are expected to take part in the halfway evaluation at the midpoint of each semester and in the final evaluation, which takes place every third time a semester is completed. The halfway evaluation is conducted by a member of teaching staff. The idea of the halfway evaluation is that the information gathered from you can be used to develop and adapt the current course of instruction. The purpose of final evaluation is for the programme team to collect from you information that

can be used to improve the organization and conduct of teaching on the programme with a view to the programme's coherence and progression.

You can access results, KPIs and action plans on Studienet (Aarhus) and Studienet (Horsens) and where further information about quality procedures at VIA University College is also available.

SEMESTER STRUCTURE

The semester is described in the curriculum and in this semester syllabus. Link to curriculum: click here. The content of the semester project will be described in more detail in the semester case study issued at the start of the semester.

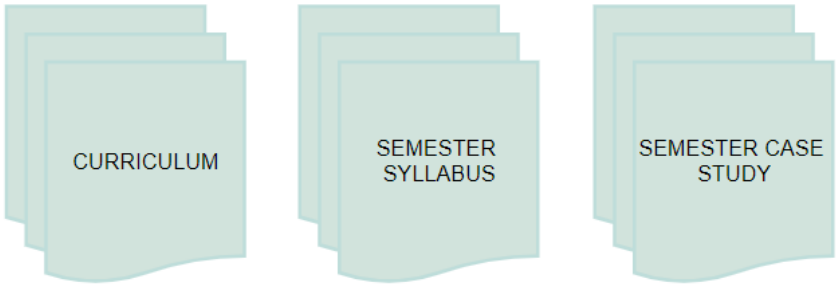

Figure 1: Document hierarchy, Semesters 1-5
Source: Prepared at VIA Built Environment

In the semester's 'Renovation' National subject element, you will mainly be working on one continuing project. As shown in Figure 2, each subject will be aimed at the project. Theoretical presentations by teaching staff will often be concentrated at the start of the course; later, the teachers will mainly assist with guidance and advice on the project. It is through the process of working to solve the problems set that you, the student, will develop your competency as an Bachelor of Architectural Technology and Construction Management.

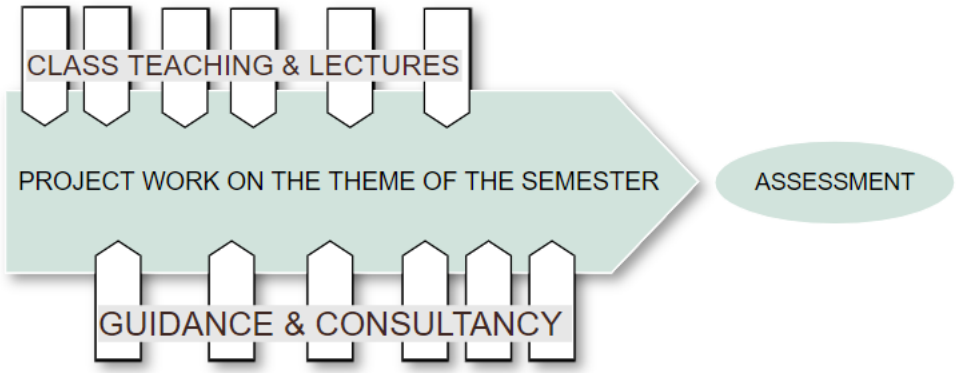

Figure 2: Interdisciplinary project work
Source: Prepared at VIA Built Environment

PROJECT WORK

Students work on an interdisciplinary project throughout the semester. The project work consists partly of assignments to be tackled individually and partly of assignments to be tackled in groups. The reason for working in groups on a specific project is partly that this is a very widely used working style in the building industry, and partly that there is learning value in problem-focused collaboration with other students whose experience and skills are different to yours.
Although students work in groups, it is nevertheless important that you as a student can independently acquire and apply the knowledge you gain from the individual subjects.

TEACHING

Teaching is based on the principles of problem-based learning (PBL), in which the teaching staff act as guides. This form of instruction is combined with academic presentations in the form of classroom/auditorium teaching. Students work on different types of building technology problems and the administration of a building project. In the course of their day-to-day studies, students are expected to present sketches, provisional drawings and solution proposals for discussion by students and teachers. The Portfolio and study technique are important tools of the programme, to be used to reflect on your own learning.

EXAMINATIONS

As a student, you must take a number of examinations/evaluations in the course of your studies. There is information on these in Chapter 7.7 of the curriculum, *Examinations*. The curriculum is available here. General information on examinations is available on Studienet (Horsens) and Studienet (Aarhus).

Table 1 shows the semester's subject elements and how they are assessed, in accordance with Chapter 7.4 of the Curriculum.

Study element	Assessed before concluding examination	Assessed at concluding examination
Examination 6: Project work on Renovation & LPE results to be presented and incorporated into the semester's project work.		X
Examination 7: Project documentation re Elective 3.		X

Table 1: Study elements and their assessment
Source: Prepared at VIA Built Environment

STUDY ACTIVITY

Full study activity means that the student spends 825 hours per semester, i.e. approximately 41 hours per week, on study. The study activity model shows how these hours are divided between different teaching and working formats. Not all learning is to be initiated by teaching staff and/or with a member of staff present; this means that you, the student, bear considerable responsibility for your own learning. The programme involves working on professional skills, collaboration and independence in order to equip the student to take on highly responsible professional roles. The student is expected to assume greater independent responsibility semester by semester.

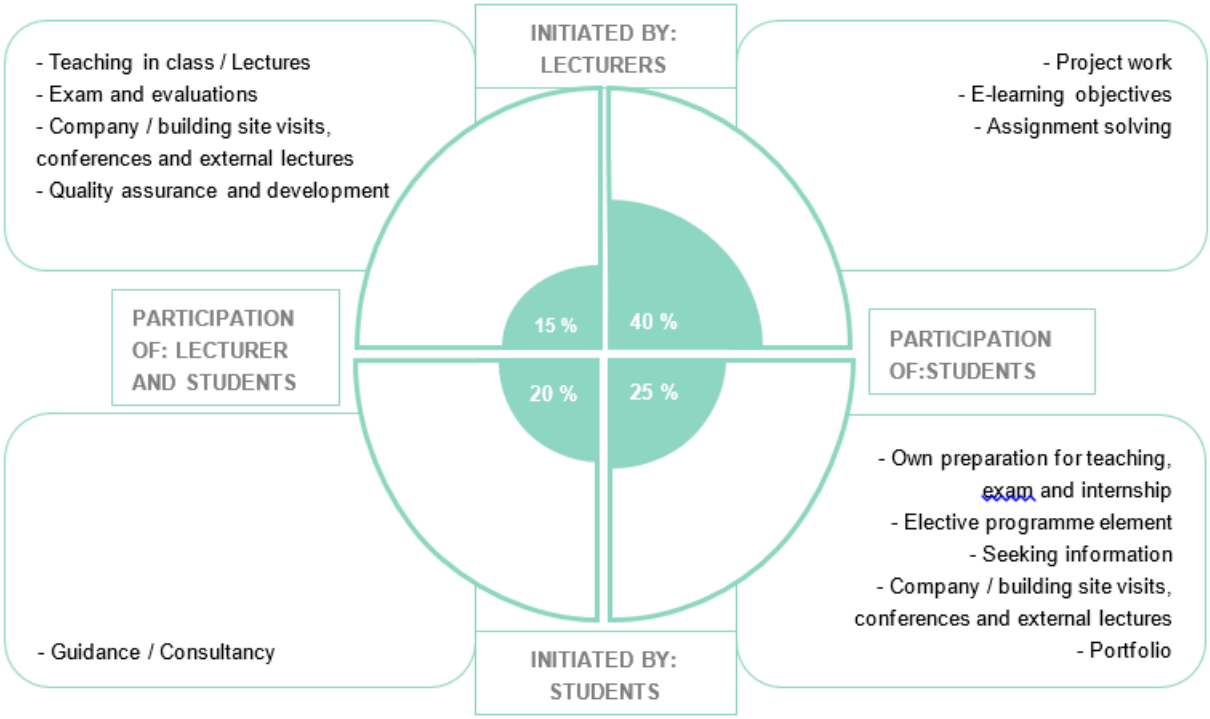

Figure 3: Semester 5 study activity model
Source: Prepared at VIA Built Environment

SUBJECTS

The programme's interdisciplinary learning objectives for Semester 5 are set out in the section of the curriculum on the National subject elements of the programme.

The point of departure for instruction in the individual subjects is the semester's interdisciplinary project. Single-subject teaching covers rules, theories, methods and techniques within each specific professional discipline. The teaching of the individual subjects will also indicate how the content of the subject can be brought to bear on the interdisciplinary work on the semester case study.

The content of the individual subjects is described on the following pages. The content is described at a general explanatory level. The precise teaching topics within the subjects are set out in the teaching schedule, which is available on ltslearning at the beginning of the semester.

Examples of subject-based interpretations of the Semester 5 interdisciplinary learning objectives for the individual subjects are given in Annex 1. Both separately and together with your project work, the subject-based presentations of the individual subjects will support your attainment of the semester's learning objectives.

Table 2, below, shows the subject distribution of the semester in percentage terms.

Subject	Subject areas	Distribution
Building design (BDS)	Architecture and Building Design (BDS/ABD) Building Construction (BDS/BCN) Materials Science (BDS/MAT)	47%
Structural design (STD)	Structural design (STD)	10%
Building services (BSE)	Building services (BSE)	10%
Building Planning and Management (BPM)	Building Planning and Management (BPM)	20%
Law (LAW)	Law (LAW)	13%

Table 2: Subjects, subject areas and subject distribution in Semester 5 SD
Source: Prepared at VIA Built Environment

BUILDING DESIGN (BDS)

The Building design subject comprises the Architecture and Building Design, Building Construction and Materials Science elements.
Teaching will be based on the following content:

Architecture and Building Design (ABD)
- introduction to style history, 1850–1980
- building renovation and energy improvements from a sustainable and architectural perspective

Building Construction (BCN)
- building recording, typical damage in older buildings
- sketching and structural design, layout of structures from a sustainable perspective
- statutory requirements
- layout of typical structural assemblies in renovation projects
- structural issues in post-insulation
- roof structures in renovation projects
- handling of environmentally harmful substances and reuse of building materials
- wetrooms
- steel structures and corrosion protection
- lightweight floors and walls
- analogue and digital building design and communication tools
- design scrutiny
- preliminary design and building regulations approval design

Materials Science (MAT)
- insight into timber, masonry, concrete, steel/metal, roofing materials, sheet materials, environmentally harmful substances
- information searching, analysis and documentation of material choices
- material analysis and building element analysis
- material descriptions in the content journal linked to a building information model
- material descriptions on drawings linked to a building information model

STRUCTURAL DESIGN (STD)

Teaching will be based on the following content:
- static analysis of the building before, during and after renovation
- loads and safety in accordance with European standards
- tabular dimensioning
- steel structures as building elements
- bracing of buildings during renovation
- imposts on masonry and replacement of masonry
- foundation reinforcement and underpinning

BUILDING SERVICES (BSE)

Teaching will be based on the following content:
- recording and analysis of existing structures and services
- sound analysis
- analyses relating to current Building Regulations requirements on transmission coefficients of chosen structures and elements, and on line and transmission loss
- analysis of the use of renewable forms of energy
- ventilation systems with heat recovery

- pathways, technical facilities rooms and shafts/cores in older buildings

BUILDING PLANNING AND MANAGEMENT (BPM)

Teaching will be based on the following content:
- planning tools
- relevant support scheme documents/systems
- budgeting building costs
- quantity take-off: principles and method
- pricing building structures
- logging building elements and materials
- building phases and services

LAW (LAW)

Teaching will be based on the following content:
- ABR (General Conditions for Consultancy Services) with reference to the drafting of the consultancy contract
- AB (General Conditions for Works and Supplies) with reference to the drafting of the Building Project Description
- contractual compensation
- the Winter Regulations
- procurement law in relation to the semester case study, incl. the Client/Consultant and Client/Contractor relationships
- authorization rules
- statute of limitations
- the ILO conventions generally
- recourse to court, arbitration and Procurement Board practice
- the Client-Consultant, Consultant-Subconsultant and Client-Contractor relationships

LOCAL SUBJECT ELEMENTS

A local subject element is defined as either a Local programme element (LPE) or an Elective programme element (EPE).

The local subject elements in Semester 5 are an opportunity for you to work on specific construction technology topics or problems chosen by you in the field of renovation. They will deal with an issue or a topic arising from the National subject element, 'Renovation'.

The object is for you to enhance your knowledge and competencies in the chosen area and to enhance your methodological and analytical skills and building technology competencies.

The figure below illustrates the respective positions of the LPE and EPE in relation to the National subject element.

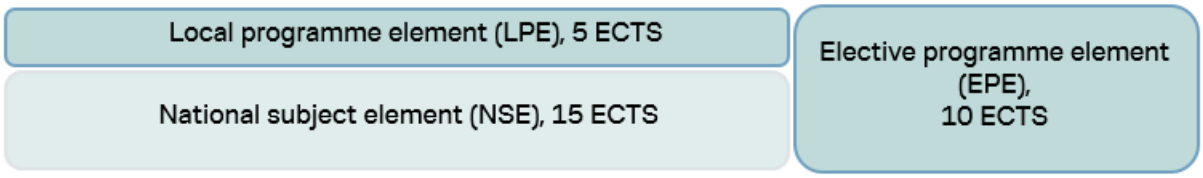

Figure 4: ECTS distribution, Semester 5
Source: curriculum

ELECTIVE PROGRAMME ELEMENT

To strengthen collaboration between students and to provide the elective with the best possible instruction and advisory support, the College has defined the following study routes:

A. structural design
B. special interprofessional route

The learning objectives and content of the electives are detailed in Section 7.1.3 of the institutional part of the curriculum, Elective Programme Element, Semester 5.

The elective consists of individual study. However, it is possible to work on the elective in a group, but in this case it is important that your personal part of the assignment is clearly defined, because it is important for the examination that your ability to work independently to a professional standard can be assessed. You will be introduced to the elective by your supervisors.

Route A:
Structural Design
Study route A is the student's opportunity to attain structural design competencies at tender design level from a renovation perspective.
The student will be able to extend his/her knowledge, skills and competencies in sub-elements such as:

- understanding tender documents for a renovation project at tender design level
- skills associated with the preparation of a tender design
- material selection and building process from a renovation perspective
- complex building technology topics relating to the National subject element
- interdisciplinary collaboration
- communicating tender documents at tender design level to partners

Route B:
Special interprofessional route
Study route B is the student's opportunity to attain cross-professional competencies from a renovation perspective.
The route may consist, for example, of one or more study elements relating to the National subject element:
- local renovation projects, e.g. projects for which municipalities or other stakeholders have invited the Architectural Technology programme to prepare proposals
- local renovation projects identified by the student him/herself
- special investigation in collaboration with an external partner, e.g. investigation/analysis of a technical building or engineering topic
- an IP (Intensive Programme), typically a two-week project part-funded by the EU. Small groups of students from several European universities take part in a joint project.

LOCAL PROGRAMME ELEMENT

The student must complete a Local programme element (LPE) in Semester 5. The student must bring to the Local programme element the knowledge gained from the subject areas of the programme. Figure 4 shows when in the semester the element is taken. The format is self-study, possibly interspersed with individual presentations and facilitative supervision. The learning objectives and content of the Local programme element are detailed in the institutional part of the curriculum, in Chapter 7.2, *Local Programme Elements (LPEs)*.

The Local programme element runs in parallel with the National subject element and is integrated into the same case study. The knowledge and skills gained will thus be implemented in the National subject element of the semester.

The student chooses one of the following main topics, which will be tailored to the National subject element of the semester:
- **Build 4.0**
- **Sustainable Building**
- **Energy-Efficient Building**

A study design (synopsis) is to be prepared on the chosen main topic and submitted to the supervisor at the beginning of the course. The study design will be refined, and the knowledge and skills acquired will be implemented in the semester's National subject element (the semester project).

Build 4.0
The 'Build 4.0' Local programme element is the student's opportunity to gain an educational specialization in the tools and methods associated with Build 4.0 within structural design/construction management.

'Build 4.0' is the construction sector's version of the fourth industrial revolution. It means digital technologies, tools and methods that promote optimization in construction through automation. 'Build 4.0' thus encompasses the use of new technology and digitalization in the construction and civil engineering sector.

The student will be able to extend his or her knowledge, skills and competencies in sub-elements such as:
- **recording** with digital tools such as scanning and photogrammetry, plus data processing;
- **visualization and communication** with digital tools such as Virtual Reality (VR) and Augmented Reality (AR), and digital production technologies such as 3D printing and laser cutting;
- **extended BIM design**, e.g. coordination, structuring, IFC, relevant project platforms, complex 3D building elements and relevant methods associated with other subject areas such as sustainability or renovation;

- **virtual design & construction**: the use of building and site simulation, digital quality assurance and documentation tools etc.;
- **automation, coding and Big Data**, e.g. visual programming, automated construction processes such as robots, and the Internet of Things in operation and maintenance.

Sustainable Building
The 'Sustainable Building' Local programme element is the student's opportunity to gain an educational specialization in sustainable building within structural design/construction management.
The student will gain a deeper understanding of sustainability both as a concept and as regards its importance to each particular building project. Taking a holistic approach, the topic will adopt both a global and a local perspective. Working on the LPE will alert the student to the challenges of the phenomenon from a conversion and development point of view.

The student will be able to extend his or her knowledge, skills and competencies in sub-elements such as:
- the UN Global Goals
- different certification systems
- national, regional and local sustainability strategies
- understanding the historical perspective in Denmark, including earlier focus areas such as energy in the 1970s
- life-cycle assessment/sustainable material selection (LCA)
- life-cycle costing/economic sustainability (LCC)
- social sustainability
- the circular economy
- circular building
- circular renovation
- circular design strategies (e.g. design for disassembly)
- circular procurement
- circular/sustainable business models
- sustainable and alternative materials and structures
- sustainable operation and maintenance
- the sustainable building site (energy consumption, waste sorting, recycling etc.)
- legal aspects of sustainability

Energy-Efficient Building
The 'Energy-Efficient Building' Local programme element is the student's opportunity to gain an educational specialization in energy-efficient building within structural design/construction management.
The student will gain a deeper understanding of active and/or passive energy measures both as a concept and as regards their importance to the particular building project.

With the energy requirements of the Building Regulations as a point of departure, the student will be able to extend his or her knowledge, skills and competencies in sub-elements such as:
- energy consumption during building construction
- energy consumption associated with building operation
- lighting technology issues such as daylight and artificial lighting, taking window design and orientation into account
- design of energy solutions and/or energy improvements within the Building Regulations' requirements on energy consumption and energy supply systems
- study of alternative tools used to verify energy needs and energy consumption
- study of how building design affects real energy needs
- estimated calculations on the chosen energy solutions and assessment of their validity
- alternative heating needs and types
- energy needs for ventilation

ANNEX 1

SUBJECT-BASED INTERPRETATION OF LEARNING OBJECTIVES

This annex presents an indicative interpretation of parts of the Semester 5 learning objectives of the curriculum in relation to the individual subjects. The interpretation may help you gain a concrete understanding of some of what is expected, but it does not give an exhaustive picture of what you must learn during the semester. Indeed, part of what you must learn is interdisciplinary and not amenable to being described within the framework of the individual subjects.

To get a full grasp of what you are expected to learn, you therefore need to read the semester learning objectives in the curriculum. As a student, in Semester 5 you have reached a point in your training where you will now be working professionally on your own learning and hence on the pre-requisites for acquiring knowledge, skills and competencies. The theme of Semester 5, 'Renovation', is the Bachelor of Architectural Technology and Construction Management's most difficult discipline.

Overview of learning objectives supported by instruction in the individual subjects

Building design (BDS)
The Building design subject comprises the Architecture and Building Design, Building Construction and Materials Science elements.

Architecture and Building Design (ABD)
Knowledge
The student shall possess development-based knowledge of:
- the history of older multi-storey residential buildings;
- the methods and practice of the discipline in relation to renovation of multi-storey residential housing built in the period 1850–1980 approx.;
- building history and different local and international approaches to renovation;
- and be able to understand the effect of sustainability and energy improvements on existing architecture and future design.

Skills
The student shall be able to:
- evaluate and design building improvements, with consideration and respect for existing architecture and design.

Building Construction (BCN)
Knowledge
The student shall possess development-based knowledge of:
- and be able to understand and reflect on methods and techniques for planning and designing the renovation of older buildings, with particular emphasis on energy improvements through sustainable renovation/conversion/extension;
- and be able to understand and reflect on building physics issues, structures and details in older multi-storey buildings;
- legislation, literature, guidelines etc. constituting the generally accepted technical basis of renovation and conversion projects in Denmark;
- analogue and digital building design and communication tools.

Skills
The student shall be able to:
- show proficiency in working methods for preparing a preliminary design and building regulations approval design, taking sustainability aspects into account;
- assess building physics issues and aspects, and make reasoned choices;
- communicate practice-oriented and professional issues and solutions using digital information models.

Materials Science (MAT)
Knowledge
The student shall possess development-based knowledge of:
- and be able to understand the use of materials in relation to the National subject element of the semester;
- environmentally harmful substances in building materials;
- and be able to understand the incorporation of materials into structures, their function and performance in relation to use, including relevant buildings.

Skills
The student shall be able to:
- show proficiency in the preparation of material analyses, and substantiate and select materials for incorporation into existing structures;
- assess and document material choices;
- show proficiency in the compilation of a content journal;
- show proficiency in material descriptions and communicate via a digital information model.

Structural design (STD)
Knowledge
The student shall possess development-based knowledge of:
- and be able to understand the cohesive stability of the building before, during and after renovation;
- and be able to understand and reflect on tabular dimensioning;
- and be able to understand and reflect on assembly methods in relation to renovation;
- bracing methods in relation to renovation.

Skills
The student shall be able to:
- show proficiency in and communicate static systems;
- evaluate and substantiate structural connections between existing and new building systems;
- use tables to dimension steel columns and beams;
- substantiate the method chosen in design and planning;
- evaluate the use of industrial building elements as part of the static system;
- evaluate and select relevant buildings relating to statics requirements in the BIM model, and communicate drawing extracts from the model showing these buildings;
- show proficiency in collision and consistency checks on drawing extracts.

Building services (BSE)
Knowledge
The student shall possess development-based knowledge of:
- existing supply cables/pipes;
- building services in older buildings, including service pathways and materials, and water, heating and drainage principles;
- mechanical balanced ventilation with heat recovery in older buildings;
- theory and method for improvement of acoustic conditions in older buildings;
- and be able to understand and apply theories and methods of energy optimization of older buildings and extensions, including the use of renewable forms of energy.

Skills
The student shall be able to:
- make and communicate proposals for improving acoustic conditions in older buildings;
- select and evaluate the most suitable ventilation system;
- analyse and communicate pathways for water, heating, ventilation and discharge pipes taking account of space, fire and acoustic conditions;
- apply relevant energy requirements in accordance with Building Regulations;
- analyse and communicate possible alternative energy sources.

Building Planning and Management (BPM)
Knowledge
The student shall possess development-based knowledge of:
- the general political, legal, administrative and economic contexts of urban renewal in Denmark;
- and be able to understand the Health and Safety Plan (HSP) and reflect on it in relation to the project phases and contract type;
- and be able to understand principles and possible uses of the BIM model in connection with collision checking and consistency.

Skills
The student shall be able to:
- use professional and interdisciplinary teamwork documented through methodology and working process;
- use the methods and tools of the discipline in structural design of renovation within the framework applicable to urban renewal;
- use systematic data collection in order to prepare descriptions relating to the case study;
- use quantities in his/her own renovation project, and use them for calculation;
- use and show proficiency in general network planning for the project;
- use and show proficiency in the BIM model for QA;
- show proficiency in the appointment of a safety coordinator;
- use and show proficiency in the skills associated with drawing up a master schedule;
- evaluate and select relevant organizational structures, contract types and forms of collaboration, including project management;
- substantiate and select an approach to incorporating requirements from the Danish Association of Architectural Firms/ Danish Association of Consulting Engineers description of services into project planning;
- communicate a report outlining relevant management types and organizational structures.

Law (LAW)
Knowledge
The student shall possess development-based knowledge of:
- and be able to understand and reflect on contractual compensation (with reference to the AB system);
- and be able to understand and reflect on the regulations on expiry of liability, including complaints and time limits.

Skills
The student shall be able to:
- carry out and show proficiency in the drafting of a consultancy contract, including the ability to evaluate, substantiate and select relevant deviations from ABR and to communicate the consequences thereof for the consultant's liability and authorization;
- carry out and show proficiency in the drafting of the contractual basis of the building project description on the basis of AB, including the ability to evaluate, substantiate and select any deviations/addenda, particularly in respect of defects, time/delays and payment (top-up to Semester 3) and additional works, handover and expiry of liability;
- communicate the chosen solutions to partners;
- communicate an account of provisions of the procurement regulations relating to equal treatment and transparency, and of the significance of the procurement procedure chosen in the case study.