

# Elective course

Plumbing vocational Training

Intelligent Building Installations

## 1. Course Title

Intelligent Building Installations (IBI).

## 2. Course Duration

36 lessons (9 modules á 4 lessons).

## 3. Course Objective

The main objective of the course is to provide the students with basic knowledge and skills on intelligent building installations. The specific installations covered in this course are EIB-installations (European Installation Bus) and IHC-installations (Intelligent House Control); herunder knowledge of components, programmes and programming parameters, and a basic knowledge of rules, regulations and codes for such installations, and a knowledge of present development trends within the IBI area in Europe.

Specific objectives of the elective are that the student in an action-learning context obtains:

- a. State-of-the-art knowledge of basic cybernetics and intelligent building installations.
- b. An elementary practical experience in carrying out small intelligent building installations.
- c. A basic knowledge of economical and environmental aspects of intelligent building installations compared to traditionally controlled and managed building installations.
- d. Introduction to present IBI market positions for the plumbing and electrical sector.
- e. A future workshop (zukunftwerkstatt) based on this background information on the various futures of IBI, relating to possible customer marketing of IBI, and to development, regulation and control of future IBI installations.
- f. Skills in the writing and in-class transfer of a presentation of present and potential future technologies for intelligent building installations.
- g. Technical knowledge and environmentally sound attitudes relating to the installation, regulation and control of future building installations.

## 4. Content, didactic organisation and student activities

### ***Content***

The elective contains the following content phases:

- General cybernetics, regulation and control intelligent building installations.
- Problem- & project formulation, for groups of 2-4 students.
- Local and regional mapping of actual full scale IBI-installations and components.
- Excursions, company visits, company consultants as visiting lecturers.
- Strengths and weaknesses of individual IBI systems.
- Theoretical and practical exercises with small IBI-installation.
- Future workshop.
- Preparation and transfer of presentation to class of group project report.
- Evaluation.

### ***Didactic organisation***

The teaching and learning forms are based on the principle of "the student is a co-worker on his/her own learning process".

Active forums for student co-decisions in the learning process acts as stimulants for the students motivation to learn, for the active participation in the general school curriculum and in the positive end result of the overall students training program .The presence of a co-

decisional process is an important precondition when the development of the core competences and key qualifications are addressed.

Teachers/trainers and students cooperate in the planning and furthering of the learning processing. In order to qualify the student in this co-worker-role, and the student is involved in the evaluation of her own obtained qualifications and competences.

It is important that the elective course contains democratic fora. It is however equally important that the limits for this student influence are described, within which the concurrent discussion and dialogue of the course content can take place.

The co-decision process is thus an important means to achieve the technical, common and personal objectives of the course.

### **Organisation**

It is the basis of the description below that the elective is carried out over a period of 9 weeks organised as modules of 4 lessons each. It is equally possible to organise the course as 5 weeks of 7 lessons, or perhaps as a continuous course of one week's length.

### **Student Activities, described as 9 modules á 4 lessons**

#### **1<sup>st</sup> and 2<sup>nd</sup> module, 8 lessons (2 modules á 4 lessons)**

Contents:

- Presentation of the IBI-course structure and content.
- General and common principles of cybernetics, control and regulation.
- Special emphasis is placed on the present strengths and weakness of conventional control/regulation systems, and on the environmental consequences of conventionally as compared to intelligently controlled installations.
- A focal point should be the limitations of conventional control systems and on related building legislation at new building or major urban renewal work.
- The students carry out library and on-line research and use ICT as the main tool throughout during the course.
- Introduction to the ICT by teacher/trainers as required.
- The student group prepares for excursion at manufacturer/sales company or main user of IBI-installations.
- The students divide into groups and each group formulate their project formulation and prepare a project plan for comments and approval by teacher/trainer.

#### **3<sup>rd</sup> module, 4 lessons**

Contents:

- The groups carry out their excursion to IBI-suppliers and IBI-users. Both types of excursions host should be covered by the groups as a whole.
- The students collect information on the design, installation and function, and asks supplementary questions in relation to their project formulation and project plan, especially relating to module 7 and 8.

#### **4<sup>th</sup> module, 4 lessons**

Contents:

- Debriefing and short mutual exchange of excursion results.
- Planning and task distribution within group for execution of sub-project in module 7 & module 8.

- Library and on-line research on IBI, selection of materials to be used in module 7 & module 8, including the use of product information and product/system software.
- Discussion on strengths and weaknesses of individual IBI-systems.

### **5<sup>th</sup> and 6<sup>th</sup> module, 8 lessons**

Contents:

- Lectures and practical assignments on the in Denmark commonly used IBI-solutions and components. This should as a minimum cover a basic theoretical and practical knowledge of the systems EIB (European Installation Bus) and IHC (LKs Intelligent House Control).
- In these modules the practical exercises can take place at suppliers customer training premises or in electrical department of own vocational school (where IBI is already part of the VET special core curriculum).
- General principles for DC and AC, high voltage and low voltage.
- Different principles for IBI: System types, installation design, programming parameters, legislation, etc.
- surveillance, control & regulation, interface to other services and control panels.
- Central controller: programming, time control, light control, P-net, IHC-documentation.
- European Installation Bus: Scenarios, building visualisation, alarm functions, clock functions, zoning, coupling, sensors and actuators, bus lining.

### **7<sup>th</sup> module, 4 lessons**

Contents:

Future workshop on requirements and possibilities of next generation of IBI installations

- Fantasy phase.
- Problem phase.
- Reality- and action phase.

In the future workshop the following tools are recommended:

- META-plan method.
- Mind maps.
- Ishikawa diagrams (fishbone diagrams).
- SWOT analysis.

The Future workshop is carried out on a group basis, each group keeping a workshop protocol for each phase, with the results carried over to module 8 and module 9.

### **8<sup>th</sup> and 9<sup>th</sup> module, 8 lessons**

Contents:

- On a group basis, finalisation of report or other graphical presentation on the project theme.
- Group present its report or other presentation for class.
- Summing up on results in the presentations.
- General evaluation of project, process and product.
- Individual student evaluation on course process, in relation to own performance, participation and resulting qualifications and competence on course subject.

## **5. Evaluation**

The teacher/trainer carries out a continuous evaluation of the group work with the aim of revision of the project plan and the task distribution within.

The school issues a certificate to all students who have satisfactorily completed the course.

## 6. Course economics

Books and software on the subject of IBI	1000,00
On-line research and communication	500,00
Components/equipment for practical assignments module 4 - 5 (in stock)	0,00
consumable materials for module 5 - 6	2500,00
Travel costs for excursions	500,00
In all	<b>4500,00</b>

All prices are in danish kroner (7 kr = 1 euro) and less value added tax.

## 7. Teacher/trainer qualifications

The teacher/trainer must:

- Have a teacher training equivalent to the level for basic vocational teachers course as offered by the Danish Vocational Teachers Institute (DEL).
- Have a theoretical, practical and updated education and knowledge within the plumbing sector or electrical sector, supported by a specialist background within regulation & control of building installations in general, and for intelligent building installations.

## 8. Teaching facilities and teaching materials

- Access to Internet.
- The search facility at VVS uddannelsesbiblioteket on [www.vvsu.dk](http://www.vvsu.dk).
- Rooms for group work and for future workshops og til fælles fremtidsværksted.
- Workshops for practical assignments in module 5 and module 6.
- Teaching materials from electrician VET program student files, and from the skill upgrading courses for electricians on IBI, EIB and IHC installations.
- Materials from Siemens (Gladsaxe), TAC Europe, Honeywell, and LK (Ballerup).

Descriptions and examples of the principles behind the future workshop tools ( Future workshop, Mind Maps, META- PLAN, Ishikawa-diagrams, SWOT-analysis) listed in module 7 can be found in the student files for the danish plumbing VET-apprentices, in the course file 1 and course file 2.