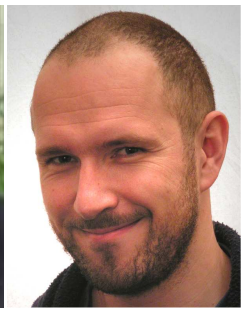
SUSTAINABLE BUILDING EDUCATION AT FACULTY OF CIVIL ENGINEERING CTU IN PRAGUE

Karel Kabele | **Jiří Novák** | **Jan Tywoniak** | **Petr Hájek**

Summary

This paper brings a brief overview about running teaching activities at the Faculty of Civil Engineering CTU in Prague dealing with sustainability agenda and its implementation to building design and construction. A new master study programme directly focused to the problem of design of sustainable buildings: Buildings and Environment will start in this fall term. Basic information about courses on sustainable building for practitioners (long-life learning, e-learning) is also presented.

Keywords: Master courses, Buildings and Environment, long-life learning, e-learning, built sustainability

1 Introduction

The need to promote sustainable principles requires implementation of new sustainable oriented knowledge and other results from research into education on all levels – starting from primary schools up to university education. Universities have a key responsibility in dissemination of new high professional knowledge within the bachelor, master as well as PhD study programs, and also into the area of practising professionals. The urgent need of this dissemination is due to relatively large amount of new information about interaction of environment, industrial development, economy, social aspects. Consequently, these new information promote the research and development of new materials and techniques using advanced approaches (e.g. nano-technology, intelligent control of processes etc.) and associated application of results into the industry practice.

In the field of building design and construction Civil Engineering and Architectural Faculties are responsible for performance of relevant sustainability oriented research and development of education system which will reflect new sustainability agenda.

Faculty of Civil Engineering at the Czech Technical University in Prague has a long and wide experience in the building sustainability oriented research (energy and material efficient buildings, complex assessment of sustainability of buildings, high performance materials, recycled materials, use of renewable energy etc.). Based on this knowledge and

experience new master program Buildings and Environment and courses for long-life and e-learning of practising engineers and designers have been developed and started. This process was inspired also by some similar education activities at other universities abroad.

2 Buildings and Environment - new master study program at CTU in Prague

New study program was introduced as a part of a new scheme of "structured studies" (bachelor-master-PhD). The new master program is focused on conceptual solution of building energy and environmental systems and building structure considering wider context of sustainability. Students will get knowledge about environmental and energy performance of buildings, which gives them opportunity to get ability to apply integrated approach in the solution of different problems in the advanced design of buildings.

Theoretical courses from applied mathematics, physics, theory of sustainability, and assessment methods give the base for further studies. Practical courses are organized in two specializations – **Building Services and Building Structures**. These two specializations contain traditional courses, like heating, ventilation, air-conditioning, power distribution, control systems, together with knowledge about building physics - thermal, lighting, acoustics, effective material use. Subject **Systems of Buildings** should integrate both approaches – "structural" and "technical-services"-oriented, with integrated design principles.

The study program is organized in two semesters of lectures and practical training, together with individual studies and excursions. Diploma theses will be prepared in the 3rd semester. The study program starts this fall 2007 with 40 students. Also full English version of this program is prepared and accredited. We expect that it will start in the next fall 2008.

3 Sustainable Building – courses for lifelong learning

Practical implementation of sustainable building principles requires a specific knowledge and approach which are still little spread in building practice. Hence, no progress towards sustainable building could be expected without a sufficient number of qualified specialists. In the future, the current lack of specialists would be filled with graduates, who attended the subjects directly focused on sustainable building during their master studies (e.g. graduates from new master programme Buildings and Environment at CTU in Prague). However, this process may take a certain period of time and in the meanwhile, it is important to offer a possibility of further education to contemporary building practitioners. The Faculty of Civil Engineering supports such process, for instance by the project "Sustainable building – courses for lifelong learning".

This project is focused on both theoretical and practical education of basic principles of sustainable building. The goal of the project is to create and validate (by means of pilot courses) a set of specially designed courses which should provide the basic information about the sustainable building for a large community of building practitioners. The participants will acquire:

- basic theoretical knowledge of sustainable building principles
- overview of environmental quality assessment methods

- basic experience with sustainable building design approach
- overview of progressive design and assessment tools and a possibility to work with some of them

The Faculty of Civil Engineering is in charge of this project which started in February 2006 and will finish in December 2007. A financial support was granted by the European Social Fund, the State Budget of the Czech Republic and the budget of the city of Prague. Participation in the pilot courses is free.

The detailed information about the aims and progress of the project is to be found in www.substance.cz/kurzy (in Czech only).

3.1 Target group

The courses are intended for architects, designers, builders and consultants – experts in the fields of HVAC design, lightning, energy savings, etc.

3.2 Daily courses

Daily courses are divided into two groups:
- course 1 – Design and assessment of energy-efficient buildings
- course 2 – Design and assessment of sustainable buildings

Both courses have the similar structure and both take five working days. The content of the courses is divided into several topics. Theoretical lectures (given by the prominent Czech specialists) are prepared for each topic (**Fig. 1**). Practical seminars related to the same topics follow the lectures.

In the seminars, the participants work on practical examples representing typical energy-efficient and sustainable building design problems. Modern and progressive software tools are used to find out environmentally optimized solutions. The seminars are conducted by the lectors and researchers from the Department of Building Structures and the Department of Microenvironmental and Building Services Engineering.

Fig. 1 Daily courses – lectures for practising engineers and architects

3.3 Distance courses – e-learning

The distance courses will be offered in the form of on-line courses via internet. The content of the internet e-learning programme is a synthesis of course 1 and course 2 mentioned

above. Since the content is rather extensive, the e-learning programme is divided into four partial courses which can be attended progressively:

- course E1 Energy-efficient building design
- course E2 Energy-efficient building assessment
- course E3 Sustainable building design
- course E4 Sustainable building assessment

The preparation of these on-line courses is currently in progress.

Two out of three planned sessions of pilot courses have already taken place. Both pilot courses sessions have been appreciated by a large public. The most frequented was the course 1 – „Design and assessment of energy-efficient buildings“. The demand always exceeded the capacity of the course. At the end of the course 1 the participants were often interested in signing for the course 2 – „Design and assessment of sustainable buildings” in order to get an overall outline about the wide range of sustainable building related aspects.

4 Intelligent Buildings – preparation of new interfaculty master study program

The preparation process for a new master study program Intelligent Buildings is now on progress. This interfaculty program will contain courses prepared by Faculty of Civil Engineering, Faculty of Mechanical Engineering and Faculty of Electrical Engineering of the Czech Technical University in Prague. The basic idea is to integrate best available knowledge in the field of effective design of buildings from the point of view of structural and architectural design, design of building services as well as intelligent control of all electrical systems in buildings. The emphasis on sustainable building approaches is present in the most key teaching subjects.

Such wide multidisciplinary approach will be arranged in the close co-operation of three above mentioned CTU faculties. This master program is being prepared for 2 years duration and will be available in both Czech and English versions. The start of the program is expected since fall term 2008.

5 Conclusions

The change of building industry practice towards wider implementation of sustainable techniques, technologies, saving of energy and use of more effective materials can be speed up by adaptation of education system – in particular case by improvement of knowledge of engineers and architects in the field of sustainability agenda. This needs the implementation of sustainable principles into study programs – on university level into BSc and MSc programs and courses. In addition also lifelong courses for practicing engineers and architects are particularly in this “transformation” period very important and required. Czech Technical University in Prague is trying to do the best in this respect.

The Project CZ.04.3.07/3.2.01.2/2208 „Sustainable Building – courses for lifelong learning“ is co-financed by the European Social Fund, by the State Budget of the Czech Republic and the Budget of the city of Prague.

References

[1] www.substance.cz
[2] www.fsv.cvut.cz

Prof. Karel Kabele, CSc., C.Eng.
✉ Czech Technical University in Prague
Faculty of Civil engineering
Department of Microenvironmental
and Building Services Engineering
Thákurova 7
166 29 Prague 6, Czech Republic
☎ +420 224 354 570
🗐 +420 224 354 570
☺ kabele@ fsv.cvut.cz
URL www.fsv.cvut.cz

Jiří Novák, Ph.D., C.Eng.
✉ Czech Technical University in Prague
Faculty of Civil engineering
Department of Building Structures
Thákurova 7
166 29 Prague 6, Czech Republic
☎ +420 224 354 572
🗐 +420 233 339 987
☺ jiri.novak.4@fsv.cvut.cz
URL www.fsv.cvut.cz

Prof. Petr Hájek, CSc., C.Eng.
✉ Czech Technical University in Prague
Faculty of Civil Engineering
Department of Building Structures
Thákurova 7
166 29 Prague 6, Czech Republic
☎ +420 224 354 459
🗐 +420 233 339 987
☺ petr.hajek@fsv.cvut.cz
URL http://people.fsv.cvut.cz/~hajekp/

Prof. Jan Tywoniak, CSc., C.Eng.
✉ Czech Technical University in Prague
Faculty of Civil Engineering
Department of Building Structures
Thákurova 7
166 29 Prague 6, Czech Republic
☎ +420 224 354 574
🗐 +420 233 339 987
☺ jan.tywoniak@fsv.cvut.cz
URL www.fsv.cvut.cz