

# **IDES-EDU – NEW INTERDISCIPLINARY EDUCATION PROGRAM FOR INTEGRAL DESIGN OF BUILT ENVIRONMENT**

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## **Summary**

Buildings fulfilling all requirements related to energy, economy and environment are necessary to be designed by interdisciplinary teams with efficient transfer of information and good knowledge base.

IDES EDU is a project co-funded by the Intelligent Energy Europe program in which 15 European universities make a concerted effort to develop and implement balanced master and postgraduate courses on Sustainable Energy Design providing skills and knowledge that exceed the requirements of the EPBD. The resulting courses focus on different aspects of sustainable building design from the perspective of architecture, building construction and building technologies.

**Keywords:** Integrated Energy Design, multi-disciplinary education, Nearly Zero Energy Buildings, EPBD

## **1 Introduction**

In 2010 the European Parliament and the Council of the European Union adopted the DIRECTIVE 2010/31/EU (EPBD) a common EU goal to reduce building energy consumption by 20% together with increasing the proportion of renewables up to 20% and reducing greenhouse gases production by 20% before 2020.

High energy performance and renewable sources no doubt contribute to environment regeneration, but also may have an important impact on indoor environmental quality (IEQ).

Houses that aim to fulfill all the requirements concerning energy, economy and environment require an optimized approach especially in the design process itself which shows the highest potential. In this context, there is a substantial need for professionals

such as architects and engineers specifically trained and educated in integrated sustainable design approach and able to work in integrated multidisciplinary teams [1], addressing the need to optimize the energy use in new and existing buildings and the built environment [2], not only to produce buildings meeting current EPBD standards, but especially for buildings within the nearly zero-energy concept meeting the future EPBD. To be able to push forward the development in this field, it is essential that educational institutions foster professionals for whom cross-disciplinary work will be the basis of the design process. An initiative towards this direction is the project of Intelligent Energy Europe program IEE/09/613/ SI2.558225 (IDES EDU: “Master and Post Graduate education and training in multi-disciplinary teams”). This paper is trying to introduce this project.

## **2 IDES EDU: “Master and Post Graduate Education and Training in Multi-disciplinary Teams Implementing EPBD and beyond”**

The IDES-EDU project was created with the goal to centralize above mentioned efforts, with support from Intelligent Energy Europe project IEE/09/613/ SI2.558225. The overall intent is to educate, train and deliver specialists, both students and professionals, with a cross disciplinary profile and competency in integrated design approaches that support integrated design. In the project fifteen European educational institutions work together to develop curricula and training programmes for MSc students and professionals (Post Graduate courses, PGr) that will meet the building sector’s modern needs for experts capable of applying the integrated design approach and performing well in a cross-disciplinary and interdependent problem-solving framework.

The main aim of the project is to promote and implement the integrated design approach for buildings and energy systems and as a result to contribute to the optimisation of the market orientated implementation of the EU directives on EPBD and renewables. The project also aims to facilitate the process to reach long-term targets for a resource-efficient, low-carbon Europe by 2050.

The main objectives of the IDES-EDU project are to:

- create and implement curricula and training programmes (master and post-graduate courses, respectively) that will educate, train and deliver experts in Integrated Sustainable Energy Design taking into consideration the policies of the EU, while working in a multidisciplinary environment;
- establish close collaboration with key actors and stakeholders of the building sector at national and at European level in order to better understand their needs for new skills, knowledge and competencies and incorporate them in the curricula and training programmes;
- increase awareness, promote implementation and commitment on integrated multidisciplinary design through promotional campaigns in the building sector and exchange programmes with other European universities.

### **2.1 Idea of integrated design**

Traditional and often used design process proceeds like this: The architect and the client agree on the design concept consisting of the form concept, orientation, fenestration and the exterior appearance like characteristics and materials. Then, the engineers and

consultants are asked to implement or design technical systems for the building. This procedure seems simplistic mainly because the “active” actors in the process are limited and they are implemented linearly.

Integrated design process (IDP) tends to focus on the importance of integration of both engineering and architectural design aspects in a holistic synthesis. The most acknowledged approaches to IDP include an iterative process, where all design issues are discussed by all actors in a team. An IDP considers and optimizes the building as an entire system including its aesthetic and functional aspects, technical equipment and surroundings, all actors of the project cooperate across disciplines and agree on far-reaching and crucial decisions jointly from the beginning, the design concept is a subject to iterations early in the process, which is done by a coordinated team of specialists [3].

## **2.2 Integrated design in practice**

The number of low energy/passive/zero-energy building projects in the European building sector is increasing. Their realization has demonstrated that this type of design is not a simple task and in fact requires successful coordination of architectural, constructive, HVAC and lighting concepts in the early design stage [4].

All the countries across Europe face similar challenges within the building sector, but the situation in the educational system across Europe varies. Overall, universities are moving towards integrated design, construction and operation processes in energy-efficient buildings, though at their own pace. [5]

## **2.3 Educational programs**

The IDES-EDU project intends to educate, train and deliver specialists who will be able to follow the principles of the integrated design approach. Educational materials that have been elaborated are divided into three packages - fundamental, theoretical and practical.

Fundamental educational package contains several modules on diverse topics which create the basis for working more advanced with designing sustainable and nearly zero energy buildings. The main topic is integrated design approach. Additional modules within this fundamental package are dedicated to building and renewable energy concepts (WBREC), sustainable buildings, architectural quality, indoor environment, market and exploitation and EPBD.

Theoretical package deals with topics of building technologies like heating, cooling, ventilation, lighting and energy production.

Practical educational package includes the module cross-disciplinary teamwork, since the practical work in reality demands from the students the knowledge of methods and tools in order to perform teamwork across different disciplines. The practical educational package comprises practical methods such as design projects, project work and group work and therefore can be considered the most important package which aims to transfer the idea of the integrated design approach to students. Only if the students can experience the integrated design idea through cross-disciplinary teamwork, with learning-by-doing or problem-based learning, they will understand the impact of integrated design.

## 2.4 Realization and Implementation

A main challenge is related to implementation of new educational programmes in established curricula. In practice it proves difficult to include IDES-EDU lectures, let alone entire courses, into established educational programmes. Additionally, building up of new educational programmes does not come over night, as support from faculty is essential and a procedure of accreditation is necessary. It is expected that the full integration of IDES-EDU educational packages into established curricula will take several years, beyond the scope of the project itself. Yet, the project's time frame does provide the opportunity to test several lectures, workshops and in some cases entire courses across the participating universities. The construction industry requires a paradigm shift in which energy and resource use in buildings form a natural and explicit part of architectural and engineering education, rather than a particular form of expertise that can only be achieved through voluntary post-graduate specialisation.

## 3 Conclusion

Around the world, the number of specialisation courses on energy in buildings is rising tremendously, and the quality of the educational packages offered is not always secured. Architecture and engineering schools are challenged to rethink their curricula to absorb pressure from the media, the construction industry and students who demand courses in sustainable architecture and engineering. Universities across Europe need to develop extensive co-operation to ensure that the best practice becomes standard everywhere.

Generally, the goal is to educate students who are enlightened, innovative and independent when it comes to energy and resource use in buildings. They dare to be critical of new theories and solutions that consistently show up in ever-faster development. Simultaneously, the educational packages developed by IDES-EDU aim to solidify efficient use of energy and resources as an integrated and explicit part of building practice, education and research. This is an on-going process that requires dialogue, reflection and development.

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