FACULTY OF CIVIL ENGINEERING

SUBJECT CARD

Name in English: Adavanced building physics
Name in Polish: Zaawansowana fizyka budowli
Main field of study (if applicable): *Civil Engineering*
Specialization (if applicable): Civil Engineering
Level and form of studies: ~~1st /~~ 2nd level*, full-time ~~/ part-time~~*
Kind of subject: ~~obligatory~~ / optional / ~~university-wide~~*
Subject code: CEB007063
Group of courses: ~~YES~~ / NO*

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**		**15**		
Number of hours of total student workload (CNPS)	**30**		**60**		
Form of crediting	Examination / crediting with grade *	Examination / crediting with grade *	Examination / crediting with grade *	Examination / crediting with grade *	Examination / crediting with grade *
For group of courses mark (X) final course					
Number of ECTS points	**1**		**2**		
including number of ECTS points for practical (P) classes			**2,0**		
including number of ECTS points for direct teacher-student contact (BK) classes	**0,6**		**0,6**		

    * delete as appropriate

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. Graduation of civil engineering, environmental engineering architecture or city planning studies.
2. Has knowledge of building construction, technical drawings and general building design.
3. Knows standards, guidelines and regulations about construction and their detail design.
4. Has theoretical basis of detached house design and construction detail solutions.

SUBJECT OBJECTIVES
C1.   Gain knowledge about design rules of modern, low energy demand, ecological residential and commercial buildings and their details.
C2.   Getting acquainted with renewable energy usage possibilities.
C3.   Getting acquainted with regulations of rational energy preservation with taking thermal, visual and acoustic comfort of different rooms into consideration.
C4.   Getting basis of design team cooperation to connect form and function with rational energy usage in buildings.

SUBJECT EDUCATIONAL EFFECTS
Relating to knowledge:
PEK_W01   knows the standards, guidelines and regulations referring to the design of buildings and their components
PEK_W02   possesses knowledge about the influence of building investments on the environment
PEK_W03   has extensive knowledge in the area of selected elements, constructions and building structures
Relating to skills:
PEK_U01   is able to use advanced specialized tools when searching Internet databases and other sources which can be used to find both general information and other information related to civil engineering; is able to use information technology to communicate and know how to obtain software which is used to aid the work of a designer and the person organizing and managing building processes
PEK_U02   is able to choose a tool (analytical or numerical) in order to solve engineering issues; is able to use selected software which aid modeling and design processes in construction
PEK_U03   has skills to solve tasks referring to selected theoretical issues and also design elements, constructions and building structures
Relating to social competences:
PEK_K01   is aware of the need to constantly upgrade professional and personal competence in the form of formal or informal education and also improves and develops knowledge in the area of modern processes and technology, related to civil engineering
PEK_K02   is aware of the importance and also understands non-technical aspects and consequences of engineering activity, including influence on the environment and responsibility for implemented decisions
PEK_K03   is able to work independently and cooperate in a team on a specific task; is responsible for both the safety of his work and his subjected team's work

PROGRAMME CONTENT	
Form of classes - lecture	**Number of hours**
Lec1 Introduction, work safety regulations training. Course subjects and passing regulations talk through. Laboratory schedule talk through.	1
Lec2 Advanced problems of steady and transient heat flow through building partitions. Thermal dynamics of building partitions, thermal mass. Rules of proper building envelope design according to heat flow.	2
Lec3 Heat flow through windows and glazed facades. Types of glazing, calculation methods, technological possibilities, visual comfort of building users.	2
Lec4 New technologies in building thermal modernisation and in low energy buildings. Ecological aspect of energy saving in buildings.	2
Lec5 Low energy buildings: rating criteria, classification, design and realisation rules.	2
Lec6 The possibilities of renewable energy use in heat balance improvement of different types of buildings.	2
Lec7 Earth-sheltered buildings: classification, typical construction details, soil heat flow, heat transfer through ground walls and floors, energy conservation problems	2
Lec8 Final test	2
Total hours	**15**

Form of classes - class	**Number of hours**
Cl1	
...	
Total hours	

Form of classes - laboratory		Number of hours
Lab1	Laboratory scheme talk through. Excercises talk through. Familiarize with work safety regulations.	1
Lab2	Climate chambers research.	2
Lab3	Heat flow measurements through building walls	2
Lab4	Infrared thermal camera measurements	2
Lab5	Heat flux measurements (pyranometer, pyrgeometer, differential radiometer)	2
Lab6	Building Integrated Photovoltaics (BIPV)	2
Lab7	Thermal comfort	2
Lab8	Computational building physics	2
	Total hours	15

Form of classes - project		Number of hours
Proj1		
…		
	Total hours	

Form of classes - seminar		Number of hours
Sem1		
…		
	Total hours	

TEACHING TOOLS USED
N1. Lecture: multimedia presentation of lecture material and chosen building physics software.
N2. Laboratory: multimedia presentation, solution of problems with use of laboratory equipment and software.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1 (laboratory)	PEK_U01 PEK_U02 PEK_U03 PEK_K01 PEK_K02 PEK_K03	Final report from carried out laboratory excercises
P2 (lecture)	PEK_W01 PEK_W02 PEK_W03	Colloquium - test

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Beggs C., Energy Management, Supply and Conservation. Elsevier, 2002.
[2] Clark J., Energy Simulation in Building Design. Wiley Company, 2001.
[3] Gratia E., DeHerde A.: Passive Solar Architecture. BRE, 2006.
[4] Hens H., Buildings Physics – Heat, Air and Moisture. Ernst & Sohn, 2007.

  [5] Moss K., Heat and Mass Transfer in Buildings. Elsevier, 2007.
  [6] Twidell J., Weir T., Renewable Energy Resources. Taylor & Francis, 2006.
SECONDARY LITERATURE:

SUBJECT SUPERVISOR (NAME AND SURNAME, DIVISION, E-MAIL ADDRESS)

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MEMBERS OF TEH EDUCATIONAL TEAM (NAME AND SURNAME, E-MAIL ADDRESS)

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PhD students

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Advanced building physics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY *Civil Engineering*
AND SPECIALIZATION **Civil Engineering**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)**	Subject objectives ***	Programme content ***	Teaching tool number ***
Knowledge				
PEK_W01	K2_W06	C1, C2	Lec1 to Lec 7	N1
PEK_W02	K2_W13	C2, C3, C4	Lec1 to Lec 7	N1
PEK_W02	K2S_CEB_W22	C1, C2, C3, C4	Lec1 to Lec 7	N1
Skills				
PEK_U01	K2_U01	C1, C3	Lab1 do Lab7	N2
PEK_U02	K2_U08	C2, C4	Lab1 do Lab7	N2
PEK_U03	K2_U04, K2S_CEB_U23	C1, C2, C3, C4	Lab1 do Lab7	N2
Social competences				
PEK_K01	K2_K01	C3, C4	Lab1 do Lab7	N2
PEK_K02	K2_K02	C1, C2	Lab1 do Lab7	N2
PEK_K03	K2_K03	C4	Lab1 do Lab7	N2

** - enter symbols for main-field-of-study/specialization educational effects
*** - from table above