THE CARD OF DESCRIPTION THE EDUCATION MODULE

Name of course/module **BIONICS**			Code **AU_S_2.1_002**
Main field of study **ARCHITECTURE AND URBAN PLANNING**		Education profile (general academic, practical) **general academic**	Year / Semester **I/1**
Specialization **-**		Language of course: **Polish**	Course (core, elective) **core**
Godziny Lectures: Classes: **-** Laboratory classes: **-** Projects / seminars: **45**			Number of points **4**
Level of qualification: **II**	**Form of studies** (full-time studies/part-time studies) **Full-time studies and part-time studies**	**Education area(s)** **Technical Sciences**	**ECTS division (number and %)** **4** **100%**
Course status in the study program (basic, directional, other) **directional**		(general academic, from other field of study) **-**	

Responsible for course:

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Prerequisites of knowledge, skills, social competences:

1	**Knowledge:**	-student has explicit, theoretically based knowledge including the key issues of designing, composition and ergonomics, -student has knowledge of development trends in architectural designing,
2	**Skills:**	-student can carry out critical analysis of the manner of operation and assess the existing technical solutions, devices, systems, processes and services related to architectural designing and designing the architectural detail, -student can design the simple device and facility using correct methods, techniques and tools,
3	**Social cometences:**	-student is aware of the importance of non-technical aspects and effects of engineering activities, in this impact upon the environment and liability for environment affecting decisions, -correctly identifies and solves dilemmas related to profession.

Objective of the course:

1. Objective of the course is the use (intensification) of subconscious creative processes using metaphorical associations related to appearance, construction, functioning, development and evolution of living organisms.
2. Classes consist in finding and adapting analogy relating to nature for obtain innovative design solutions.
3. Familiarize students with methodology of searching the innovative design solutions.
4. Stimulation of creative thinking in architectural designing.
5. Practice teaching the strategy of creative drawing up.
6. To design the innovative architectural solution. Educational assumption is based on the conviction, that innovation is one of the most important factors for succeed in architect profession.

Learning outcomes		
Knowledge:		
number (symbol)	Having completed the course, student can:	Reference to the outcomes of the learning process in the area of technical sciences
W01	has knowledge of development trends and most important achievements in design, architectural designing and urban planning, design the modernization of historical buildings as well as of arts – drawing, painting and sculpture,	AU2_W02
W02	has explicit, well-grounded theoretical knowledge on designing service facilities, health care centers, offices and other work places as well as bionics, design and revitalization of urban space and facilities,	AU2_W05
W03	knows basic methods, techniques, tools and materials applied in the solutions of complex engineering tasks in the scope of designing service facilities, offices and other work places as well as bionics and design,	AU2_W09
Skills:		
number (symbol)	Having completed the course, student can:	Reference to the outcomes of the learning process in the area of technical sciences
U01	can acquire information from field specific literature, data bases and other properly selected sources in Polish and English, can integrate the acquired information, interpret and critically assess the said information, as well as draw conclusions and come up with opinions supported with satisfactory reasons	AU2_U01
U02	can plan respective stages of the designing process, can carry out analytical study of spatial resources and the best design solutions, as well as can interpret the analytic data and verify the adopted assumptions,	AU2_U04
U03	can assess the usefulness of the new scientific and research achievements and apply them in the field of architecture and town planning as well as other related fields,	AU2_U06
U04	can come up with improvements regarding the existing architectural, urban and regional spatial solutions	AU2_U09
Social competences:		
number (symbol)	Having completed the course, student can:	Reference to the outcomes of the learning process in the area of technical sciences
K01	at the execution of an engineering task/organisational task, he/she can think reasonably and act in a creative, entrepreneurial way	AU2_K02
K02	observes the principles of professional ethics; is responsible for the reliability of the obtained results of his/her work and their interpretation	AU2_K03
K03	is aware of the importance of non-technical aspects and effects of engineering activities, in this impact upon the environment and liability for	AU2_K05

	environment affecting decisions	

Methods of check the learning outcomes

Credit conditions and method of project assessment. An important criterion of project assessment is approach to the following issues:
a) searching the innovative solutions of selected problem based on bionic analogies,
b) the use of bionics as a heuristic operator,
c) improvement and rationalization of design concepts,
d) finding and separation of conflicting parts or features and searching the compromises.

Summary score:

- there are assessed work consisting of poster presenting the final effect of work on the selected design topic and portfolio, which is graphic and text report from the whole design cycle,
- the works assessment is carried out at the last classes – projects exhibition and voting for the 3 best works, which authors present the adopted design solutions in the forum of group.

Final grading scale: 2,0; 3,0; 3,5; 4,0; 4,5; 5,0

Course contents

The subject of the student's work is to develop the design solution of usable item, facility or architectural detail based on bionic analogy.

- session in the groups:
- familiarize students with the information about principles of use the bionics as a heuristic operator,
- formulation of problems and solving them in innovative teams,
- generating ideas, arrangement and valuation of solutions,
- presentation of teamwork effects in the forum of group,
- implementation of documentation from teamwork

- individual part:
- individual work on design concepts in the scope of selected issue,
- creation of concepts variants with regard to future trends, modern technologies and other issues related to project topic,
- improvement and rationalization of design concepts,
- performance the description on the innovativeness of developed project,
- performance the portfolio documenting the all stages of project work,
- performance the poster presenting the solution of selected issue.

Basic bibliography:

1. Alger J.R.M. Hays C.V. Creative Synthesis in Design, Prentice-Hall, Englewood Cliffs. 1964.
2. Balmond, C. New Structure and the Informal. w: Architectural Design. New Science=New Architecture? London. 1997.
3. Benyus, J.M. Biomimicry: Innovation Inspired by Nature. New York: W. Morrow. 1997.
4. Bonenebrg W. Nowa metoda oceny rozwiązań funkcjonalnych w architekturze. w: Zeszyty Naukowe Politechniki Poznańskiej, Zeszyt 1. Poznań, 1999.
5. Hill P.H. The Science of Engineering Design. Holt, Rinehart and Winston, New York. 1970.
6. Pallasmaa J. The eye of the skin. Architecture and the senses. London: Academy Editions. 1996.
7. Passino K. M. Biomimicry for Optimization, Control, and Automation. Springer-Verlag. London. 2005.
8. Rykwert J. The dancing column. On order in architecture. Cambridge Mass. And London. MIT Press. 1996.
9. Tarnowski W. Metody koncypowania. Politechnika Śląska. Gliwice. 1986.

Complementary bibliography:

1. Dietrych J. Projektowanie i konstruowanie. WNT. Warszawa. 1974.
2. Gordon W.J. Synectics. Collier. New York. 1961.
3. Osborn A.F. Applied Imagination. Ch. Scribner. New York. 1967

4. Wickens, C. D. Engineering Psychology and Human Performance. New York, Harper Collins. 1992.		
The workload of student		
Form of activity	**Hours**	**ECTS**
Total workload	95	4
Activities that require individual contact with the teacher	51	2
Activities of practical	44	2

Balance the workload of the average student

Form of activity	Number of hours
participation in lectures	0 h
participation in classes/ laboratory classes (projects)	45 h
preparation for classes/ laboratory classes	13 x 2 h = 26 h
preparation to colloquium/final review	18 h
participation in consultation related to realization of learning process	3 x 2 h = 6 h
preparation to the exam	0 h
attendance at exam	0 h

Total workload of student: **4 ECTS credits** **95 h**

As part of this specified student workload:

- activities that require direct participation of teachers:

45 h + 6 h = **51 h** **2 ECTS credits**