COURSE DESCRIPTION CARD

The name of the course/module **COMPUTER ARCHITECTURAL DESIGN**		Code **A_K_1.5_009**
Main field of study **ARCHITECTURE**	Educational profile (general academic, practical) **general academic**	Year / term **III/5**
Specialization	Language of course: **Polish**	Course (core, elective) **core**

Hours								Number of points
Lectures:	**30**	Classes:	**-**	Laboratory classes:	**-**	Projects / seminars:	**-**	**1**

Level of qualification:	**Form of studies** (full-time studies/part-time studies)	**Educational area(s)**	**ECTS division (number and %)**
I	**Full-time studies and part-time studies**	**Technical Sciences**	**1 100%**

Course status in the studies' program (basic, directional, other) (general academic, from a different major)

directional

Lecturer responsible for the course/lecturer:

mgr inż. arch. Marcin Giedrowicz
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Faculty of Architecture
ul. Nieszawska 13C, 61-021 Poznań
tel.: 061 665 32 60

Lecturer:

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Prerequisites defined in terms of knowledge, skills, social competences:

1	**Knowledge:**	- Student has explicit, theoretically based detailed knowledge of selected issues of generative and parametric architecture as well as technology of parametric design - Student has knowledge of development trends and most important achievements in the scope of generative and parametric architecture, architectural designing and urban planning, student is able to use knowledge from other fields related to his/her field of study
2	**Skills:**	- Student can acquire information from publications, data bases and other Polish and English sources, can interpret and integrate the said information and draw conclusions as well as voice and justify opinions - Student can assess the usefulness of the new achievements and apply them in the field of architecture and town planning as well as related field of science
3	**Social Competences:**	- Student understands the need of continuous self-education - improvement of professional, personal and social competences - Student is aware of the social role of architect and liability for affecting decisions

Objective of the course:
Introduction to the issues of generative and parametric architecture in the context of present achievements of digital technology, building materials, economic conditions as well as market sentiment. Presentation of mechanisms which control formation of building with complex geometry with using digital algorithms, NURBS curves, CNC print, modern building materials. Detailed discussion of selected examples of generative architecture based on practical application of parametric algorithms – becomes familiar students with technical software such as Rhinoceros, Grasshopper, Kangaroo, Galapagos. Presentation of issues related to history of computer architectural design in Poland and in the world.

Learning outcomes

Knowledge:

W01	Student has detailed knowledge of architectural designing in the parametric meaning, with the account for cultural context, and for private, semi-private and public space;	**AU2_W06**
W02	Student knows basic methods, techniques, tools and materials applied in the solutions of complex engineering tasks in the scope of architectural designing of complex architectural facilities with complex layout of functions, complex structural layout and complex technologies.	**AU2_W11**
Skills:		
U01	Student can identify a design problem and on the basis thereof, can draw up specifications which would constitute the basis for the design of a simple commercial facility;	**AU2_U06**
U02	Student can, when formulating engineering tasks and solving them, put together the knowledge in other fields, related areas and apply the system approach, accounting for non-technical aspects and a long time span;	**AU2_U09**
U03	Student can identify the existing functional and spatial resources, can evaluate these resources and come up with respective conclusions on possible transformations of complex, in this atypical, architectural and urban spatial tasks.	**AU2_U15**
Social competences:		
K01	At the execution of an engineering task/organisational task, he/she can think reasonably and act in a creative, entrepreneurial and innovative way;	**AU2_K02**
K02	Student is aware of the social and humanistic aspects of the architect's work - a profession of public trust.	**AU2_K06**

The evaluation methods:

Formative assessment:

- participation in lectures confirmed by attendance at minimum 6 of 12 lectures

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

Summative assessment:

- written exam containing contents passed at lectures

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

Positive grade for module depends on achieved by student all learning outcomes specified in the syllabus.

Course contents

1. Generative and parametric architecture – definitions, systematics, historical outline and current state.
2. Architectural “skin” – technological methods of building complex curved surfaces in contemporary parametric architecture.
3. 30 St Mary Axe – study of form and case study. Practical use of algorithmic sequences in parametric architecture.
4. Parametric pavilions – characteristics of phenomena, current state, the most important examples.
5. Torning Torso - study of form and case study. Practical use of algorithmic sequences in parametric architecture.
6. Parametric bridges – new element of forming urban space. Review of existing projects with history of their formation.
7. Parametric architecture in international architectural competitions and urban planning competitions.
8. Parametric workshops – ideology, current state and main realizations.
9. Kangaroo – physical simulators in generative architecture.
10. Parametric architecture and parametric architecture – two different directions in computer architectural design.
11. Evolutionary algorithms in parametric architecture – genesis, contemporary applications and example of projects.
12. Exam.

Basic bibliography:

Fuller B. Applewhite *Synergetics: Exploriations in the Geometry of Thinking*, Macmillan Pub Co., New York 1975
Giedrowicz M. *Roca London Gallery*, Archivolta, 3(59)/2013 , Wydawnictwo Archivolta, Kraków 2013, s. 66-73
Giedrowicz M. *Nowe Formy w Oksfordzie*, 1(57)/2013 , Wydawnictwo Archivolta, Kraków 2013, s. 61-65
Januszkiewicz K. *O projektowaniu architektury w dobie narzędzi cyfrowych. Stan aktualny i perspektywy rozwoju.* Oficyna Wydawnicza Pwr., Wrocław 2010
Khazabi Z. *Generative Algorithms*, digitally published Morphogenesism, 2012
Khazabi Z. *Generative Algorithms Concepts and Experiments: Strip Morphologies*, digitally published

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Supplementary bibliography:

FOO B., *Shotcrete. Practical application of support systems,* Studia Geotechnica et Mechanica, Vol. XXXIII, No. 3, 2011, pp. 3-29.
AKBAS R. M. and FISCHER M., *Examples of product model transformation in construction*, Durability of Building Materials and Components, Institute for Research in Construction, Ottawa ON, K1A 0R6, No. 8., 1999, pp. 2737-2746.
MAGNUSSON J. D., *Experience Music project in Seattle*, Modern Steel Construction, June 2001.
STEPHENS S., *City of Culture of Galicia Archive and Library*, Architectural Record, Vol. 169, June 2011, pp. 79-84.
EISENMAN ARCHITECTS, *Code X: The City of Culture of Galicia*, New York: The Monacelli Press, 2005.
FERREIRA J. P. and BRANCO F. A., *The use of glass fiber-reinforced concrete as a structural material*. *Experimental Techniques*. Blackwell Publishers Ltd. New York 2007.
ZAHA HADID ARCHITECT, *Zaragoza Bridge Pavilion*, Wiley Publishers, London 2010.
FLAGA K. and JANUSZKIEWICZ K., *Piękno konstrukcji mostowych*, Wyd. PK, Kraków, 2012.
JOHNSON N., *Soccer City Stadium, Johannesburg*, Contractors World Magazine, 2010, pp. 11-14, http://cwmags.com/cw-1-6/basic/page11.php (access: 10.03. 2014).
BRUCKERMANN O. and ALBERDI J., *Structural Design of the DRL-10 Space Pavilion,* Journal of Architectural Engineering, Vol. 16, No.3, 2010, pp. 112-118.
BRUCKERMANN O. and ALBERDI J., *Structural Design of the DRL-10 Space Pavilion,* Journal of Architectural Engineering, Vol.16, No.3, 2010, pp. 112–118.
SKOREK Ł., *Instytut Leczenia Zeza w Krakowie,* AV, Vol. 60, No. 1, 2014, pp. 72-75.

The student workload

Form of activity	Hours	ECTS
Overall expenditure	36	1
Classes requiring an individual contact with teacher	1	0
Practical classes	0	0

Balance the workload of the average student

Form of activity	Number of hours
participation in lectures	30 h
participation in classes/ laboratory classes (projects)	0
preparation for classes/ laboratory classes	0
preparation to colloquium/final review	0
participation in consultation related to realization of learning process	0
preparation to the exam	5 h
attendance at exam	1 h

Overall expenditure of student: **1 ECTS credit** **36 h**

As part of this specified student workload:

- activities that require direct participation of teachers:
  35 h + 1 h = 36 h 1 ECTS credit