Subject description

Faculty of Architecture, WUT 2020, **Architecture** studies

Architecture for Society of Knowledge speciality

EXPERIMENTAL DESIGN III ROBOstudio		**ASK3-P-Ex3**	**MSc level**	**semester 3**
Classes: **lecture** **project**	Hours/semester **15** **60**	Student's workload hours: **59**	Status: **obligatory** Level: **Advanced** **Group: arch / urb design**	ECTS: **6** Exam: **no**

Unit delivering this subject: Katedra Projektowania Architektonicznego
Pracownia Projektowania Architektonicznego Wspomaganego Komputerem

Subject coordinator: prof. dr inż. arch. Stefan Wrona

Learning outcomes and subject delivery methods

Objective of the course:

The experimental design of Robo Studio is on the verge of cybernetics and architecture. Aspects of performativity and kinetic in architectural design, as well as the fundamental issues of robotics and mechatronics, will be overviewed, based on case studies/examples, in the research phase of the studio. The purpose and problem of the course, in the form of an experimental study, is to integrate distant disciplines: mechatronics and architecture.

Projects created during the course develop the concept of responsive space, aimed at improving the quality of life, infrastructure and urban planning. The design effects take the form of specific and real architectural problems, which affects a broader spectrum of tools offered by new technologies.

General description of the course:

The concept of Architectronics deriving from kinetics, mechatronics and robotics in architectural design is not yet entirely defined. During the course, the architectronic is examined in practice, based on group developed projects. Architecture students cooperate with a group of mechatronics students, developing technical drawings, computer simulations, animations and working prototypes of their projects. The combination of architecture and engineering students aims to explore the use of robotics, mechatronics and kinetic structures in architectural practice. Both groups inspire each other during the course. Draw on their experience, knowledge and approach: architects provide a functional, social, cultural and aesthetic design basis, and engineers have technical knowledge. Final projects are created in the process of knowledge exchange between students.
In modelling, it is recommended to use tools such as Inventor, SolidWorks and Rhino with Grasshopper.
Firefly software allows a direct connection of the Arduino Uno microcontroller to the Grasshopper environment. Firefly enables the flow of information between the physical and digital world in real time, uploading/downloading data to/from the internet, remote sensors and much more.

Scope of taught competencies:

- Design task typology and valuation
- Shaping design methods and isolating specialised tasks
- Programming of microcontrollers
- The ability of professional dialogue in a multidisciplinary team
- Shaping methods for evaluating experimental results

Learning outcomes:

No. of the outcome/ area	Description
Knowledge	
W_01	Student knows the field of connecting urban planning and architectural design with mechatronics
W_02	Student has an extensive knowledge of architecture and urban planning, useful for designing complex architectural objects and urban complexes
W_03	Student knows the basic principles, constructions and building materials used in solving complex engineering tasks in the field of architectural and urban design
Skills	
U_01	Student can obtain information from literature and other adequately selected sources, integrate the information obtained, make their interpretation and draw conclusions
U_02	Student can publicly present design concepts in the field of architecture and urban planning, make a critical evaluation, discussion and logical argumentation and conduct negotiations
U_03	Student can make a critical analysis of the conditions, the valorisation of the land development, formulate conclusions for design
U_04	Student can integrate knowledge in various fields of science, including engineering problems, robotics and automation and others, and apply a systemic approach, also taking into account non-technical aspects
U_05	Student can evaluate the usefulness and the possibility of using new achievements (techniques and technologies) in architectural design
Social competences	
KS_01	Student is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the natural and cultural environment and related responsibility for decisions made in the environment
KS_02	Student can think and act creatively and resourcefuly

Learning contents:
The substantive content (design task) changes in the following years, constituting a background for the training of the competencies described above.
An exemplary project is a development in the groups of the concept of an architectural charging station for electric vehicles, using active and responsive elements.
Devices and technologies used in the project to solve problems and tasks formulated by students in the early analytical phase of the studio.
Also, student projects are designed to answer fundamental issues:
visibility - emphasising the importance of electric vehicles
usability - convincing to this solution and testifying to its affordability
cultural aspects - delineating the way of life, increasing the importance of mass culture and increasing popularity.

Teaching methods and forms :

Project -laboratory, obligatory;
Realised in a block system - continuous monthly work with the limitation of other activities.
Parallel operation on an e-learning platform serving as a store for course resources and a communication tool;
Group work in task teams
Laboratory - shaping the experimental context
Individual work with sources, analysis, presentation;
Work in the areas of many disciplines: architectural design, programming, mechatronics/robotics
Group discussion
Assessment by the team of instructors, mutual assessment, and reviewer evaluation.

Method of testing the learning outcomes:

Outcome number	Way of testing
Knowledge	
W_01	Project / experiment: presentations, defense in group discussion and among external reviewers, functional tests of created prototypes, guest reviews, video presentation published on the web, essay publication, activity assessment algorithms (as part of the e-learning platform), assessment of lecturers based on dot notes activities in individual and group work and in interpersonal relations.
W_02	As above.
W_03	As above.
Skills	
U_01	As above.
U_02	As above.
U_03	As above.
U_04	As above.
Social competences	
KS_01	As above.
KS_02	As above.

Literature

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