



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Acoustics in Architecture and Urban Planning [S2Arch1>AwAiU]

Course

Field of study
Architecture

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

- basic knowledge of physics at high school level - basic knowledge of architectural and urban design - basic knowledge of the history of architecture - basic knowledge in the field of interior design with non-qualified acoustics - the student is able to creatively use the available English-language literature - the student has basic architectural and urban design skills - the student is able to use the reverberation time equations in acoustic design of interiors - is aware of the need to educate in fields related to architecture - can work creatively in a group

Course objective

The aim of the lectures is to familiarize students with the advanced issues of architectural acoustics for rooms with increased acoustic requirements. Students learn design issues for interiors with so called qualified acoustics, acquire advanced knowledge of space formation in order to design such objects as functional as possible. In addition, they acquire knowledge of acoustic issues in urban planning, related to the issues of sound propagation in urban spaces. ACOUSTIC DESIGN: - Acquiring the ability to design acoustic rooms for interiors with increased acoustic requirements - Improving the skills of acoustic design of interiors with so called non-qualified acoustics in accordance with the requirements of the obligatory standard PN-B-02151-4 "Building acoustics - Protection against noise in buildings" - Ability to use acoustic solutions in projects carried out as part of project subjects conducted at the faculty

Course-related learning outcomes

none

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The basis for the credit is a final test which ends a series of lectures on the subject of Acoustics in architecture and urban planning.

The test is in the form of a single-choice test, which checks the knowledge of basic acoustic parameters and understanding of design tasks in architectural acoustics.

Formative assessment: assessment of the colloquium

Assessment scale: 2,0; 3,0; 3,5; 4,0; 4,5; 5,0

Summative assessment: grade obtained during the written test.

Assessment scale: 2,0; 3,0; 3,5; 4,0; 4,5; 5,0

ACOUSTIC DESIGN:

The basis for passing is the development of one project board individually by each student

Formative assessment:

ACOUSTIC DESIGN:

- Assessment of involvement in design and computational works, result of the reverberation time calculation test

- Attendance

- Independence and creativity in making design decisions in the field of architectural acoustics and correcting acoustic defects.

- One design board made individually by each student - evaluation of the quality of the boards and design solutions

Assessment scale: 2,0; 3,0; 3,5; 4,0; 4,5; 5,0

Programme content

Open space acoustics, soundscape, environmental acoustics.

Design of rooms with qualified acoustics such as churches, concert halls, dramatic theatres, cinemas, etc.

Course topics

- Acoustic ecology. Soundscape, soundmark. Urban acoustics.

- Noise maps. Protection against noise. Acoustic screens. The influence of greenery.

- Introduction to the architectural acoustics of rooms with increased acoustic requirements

- Rooms with so called qualified acoustics. Function, cubature and the required reverberation time. The shape of the room.

- Profile of the ceiling and walls. Auditory layout. A method of determining Initial Time delay Gap. The choice of chairs.

- Arrangement of sound reflecting materials. Influence of balconies on room acoustics.

- Architectural acoustics of concert halls, opera houses and drama theaters. Stage related issues.

- Shaping the orchestra pit, concert hall stage, organ in the concert hall. Multipurposes halls with regulated acoustics.

- Rehearsal halls. Technical rooms. Adaptation of the room to the sound system.

- Acoustic quality of the halls. Beranek's method, Ando's method.

- Acoustic guidelines for the design of churches. Disposition of finishing materials, sound absorption by air,

acoustic criteria for the location of organs and the choir ensemble. The volume of the room and the size of the instrument, the location of the instrument - liturgical, acoustic, thermal considerations, the location of church bells.

ACOUSTIC DESIGN:

- Repetition of issues related to the calculation of reverberation time using a statistical method
- Selection of an assignment from projects carried out during the course of study. Preparation of a model in SketchUp
- Acoustic design of an interior using CATT Acoustic. Importing the SketchUp model into CATT Acoustic. Initial familiarisation with the programme.
- Assigning sound absorption coefficients to surfaces. Assuming the position of the sound source and receivers. Correction of errors in the model.
- Working in the programme, acoustic simulations.
- Preparation of the final board

Teaching methods

1. Problem lecture.
2. Lecture with multimedia presentation.
3. Demonstration of acoustic research.
4. Presentation of acoustic materials.
5. Project.
6. Case study.
7. Working in groups.
8. Discussion.
9. Computer programs
10. ekursy.put.poznan.pl (system supporting the teaching process and distance learning).

Bibliography

Basic

1. Kulowski A., Akustyka sal. Wydawnictwo PG. Gdańsk 2011
2. Wróblewska D., Kulowski A., Czynniki akustyki w architektonicznym projektowaniu kościołów. Wydawnictwo PG. Gdańsk 2007
3. Engel Z., Engel J., Kosała K., Sadowski J., Podstawy akustyki obiektów sakralnych. Wydawnictwo Instytutu Technologii Eksploatacji – PIB, 2007
4. Sadowski J., Akustyka architektoniczna, PWN. Warszawa 1976
5. eLearning Moodle dla przedmiotu „Akustyka w architekturze i urbanistyce”.

Legislation:

1. Polska norma. PN-B-02151-4 „Akustyka budowlana – Ochrona przed hałasem w budynkach”
2. Polska norma. Ochrona przed hałasem w budynkach – Izolacyjność akustyczna przegród w budynkach oraz izolacyjność akustyczna elementów budowlanych. PN-B-02151-3.

Additional:

1. Beranek L. Concert Halls and Opera Houses: Music, Acoustics and Architecture. Springer 2004, Second Edition Newhouse Victoria. Site and Sound, Monacelli Press 2012
2. Sygulska A., “The adaptation of the stage in opera house for concert” 58th Open Seminar on Acoustics, 13-16 September 2011, Gdańsk – Jurata, Tom II, s. 297-308.
3. Sygulska A., Sale wielofunkcyjne o regulowanej akustyce, Zeszyty Naukowe Politechniki Poznańskiej Nr 28, s.35-51, Poznań 2012.
4. Sygulska A., Spatial modifications of the stage of the opera house for the needs of a concert, 3(39) Architectus 2014, s. 75-83, doi:10.5277/ARCHITECTUS
5. Sygulska A., Problemy akustyczne współczesnego budownictwa sakralnego na przykładzie Wotrubakirche i Donaucity-Kirche, Liturgia Sacra, Liturgia – Musica – Ars, Uniwersytet Opolski, ISSN 1234-4214. Rok 21/2015, Nr 2(46), str. 447-455.
6. Grygorowicz-Kosakowska K., Sygulska A., Projekt akustycznego kafla ceramicznego w architekturze wnętrz „Integracja Sztuki i Techniki w Architekturze i Urbanistyce” – Wydawnictwa Uczelniane Uniwersytetu Technologiczno-Przyrodniczego w Bydgoszczy, Bydgoszcz. Rok 2015, str. 139-148,
7. Sygulska A., Suchanek J., „Problematyka pogłosowości w sali dydaktycznej, Integracja Sztuki i Techniki

w Architekturze i Urbanistyce”, str. 103-110, Wydawnictwa Uczelniane Uniwersytetu Technologiczno-Przyrodniczego w Bydgoszczy, 2016.

8. Grygorowicz-Kosakowska K., Sygulska A., Adaptacja wnętrza sakralnego z zastosowaniem akustycznych modułów ceramicznych, Szkło i Ceramika, Nr 4/2017, pp. 23-27.

9. Suchanek J., Sygulska A., „Projektowanie architektury w aspekcie regeneracji sił fizycznych, psychicznych i duchowych, ze szczególnym uwzględnieniem akustyki”, Wydawnictwo Politechniki Poznańskiej, Tom IV, „Regeneracja architektury”, rok 2017, str.45-58.

10. Sygulska A., The study of the influence of the ceiling structure on acoustics in contemporary churches, Archives of Acoustics, Vol. 44, No. 1, pp. 169-184, 2019

Breakdown of average student's workload

	Hours	ECTS
Total workload	0	0,00
Classes requiring direct contact with the teacher	0	0,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	0	0,00