20.321
Architectural Acoustics
Fall 2020

Instructor

Jooyoung Hong

Learning Objectives

After successful completion of this course, students will be able to:

- Explain the basic principles and contemporary theories of architectural and urban acoustics.
- Measure and analyze indicators describing acoustic characteristics of indoor and outdoor spaces.
- Evaluate spatial acoustic qualities based on human comfort acoustic analysis.
- Propose acoustic design strategies that improve the performance of architectural space.

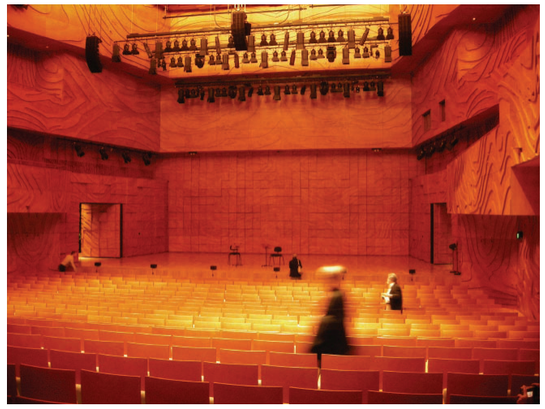
Measurable Outcomes

- Apply theoretical understanding of basic principles of acoustic design through literature review and case study analysis of architectural precedents.
- Perform experimental measurement of acoustic conditions of the spaces using acoustic equipment and calculate acoustic indicators.
- Assess quantitatively and qualitatively the acoustic performance of existing spaces through interpretation and evaluation of measured indicators.
- Develop design options using acoustic simulation methodology to enhance the acoustic performance of architectural spaces.

Course Description

Similar to other major metropolitan cities worldwide, noise pollution is a critical environmental issue in Singapore. According to the World Health Organization, environmental noise pollution, generated by transportations or industrial facilities, may cause adverse effects on human health. Thus, urban acoustics has been considered as an important environmental factor in creating sustainable and healthy cities. Also, the acoustics in an indoor environment is recognized as a critical environmental discipline. The quality of architectural and urban acoustics plays a crucial role in their well-being.

This course introduces architectural and urban acoustics by emphasizing the importance of space shaping, material selection, indoor and outdoor sound planning for enhancing our aural experiences. Topics of this course will include the fundamentals of sound and hearing, the acoustic properties of materials, room acoustics, and urban sound planning. The course is integrated with a series of lectures, reading assignments, acoustic measurements, and field trips to performing spaces. Throughout this course, students will gain the knowledge to evaluate acoustic conditions of spaces and to design indoor and outdoor environments with sound in mind.



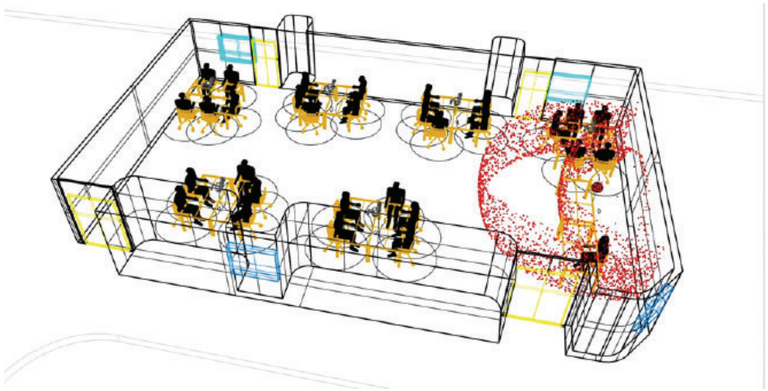


Figure 01: Acoustic simulation of speech sound propagation based on a raytracing method in a chort classroom at SUTD.

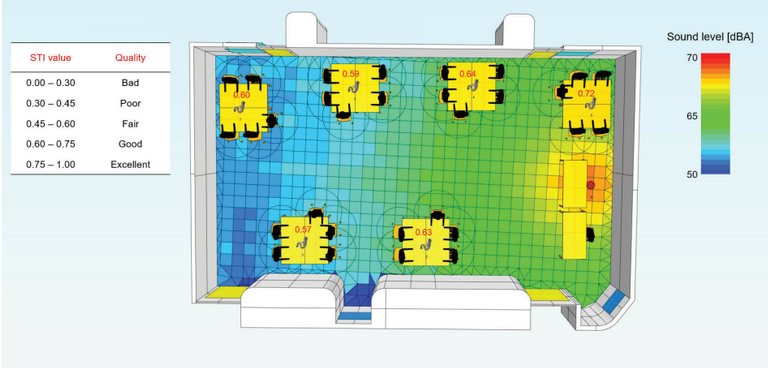


Figure 02: Acoustic simulation of speech sound level distribution and speech transmission index in a chort classroom at SUTD