



ARCHITECTURAL ACOUSTICS

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PRE-REQUISITES : Basic knowledge of Mathematics, Physics and Architecture.

INDUSTRIES APPLICABLE TO : Architectural Design Firms, Acoustical consultancy companies. The design and consultancy firms can use these lecture modules as a part of the induction programme for their newly recruited graduates.

INTENDED AUDIENCE : Anyone can learn from this course.

COURSE OUTLINE :

The lectures will be oriented towards the students of architecture and will highlight on the evolution of acoustical science and its application in design and planning until today. The fundamentals of acoustics are an essential component while designing specific spaces small and big like recording studios, class rooms, lecture halls, auditoriums. The Architectural Acoustics course is broadly classified into three sub sections and comprises of 8 modules: After introduction to the course the lectures will be on sound physics. Lectures will include various characteristics of sound, its origin, propagation and auditory sensation and the measurement techniques. Difference in behaviour of sound in closed and open spaces and the mathematical calculations will also be covered. The primary focus of the second part is on acoustical design of spaces which includes room acoustics, understanding the phenomena of reverberation and sound absorption and finally design spaces where the primary purpose is related to achieving good sound quality. It includes small spaces like class room to lecture halls or large spaces like cinema halls and auditorium. The third subsection of the course will cover the aspects of environmental noise control - both air borne and structure borne.

ABOUT INSTRUCTOR :

Prof. Shankha Pratim Bhattacharya is presently an Assistant Professor in the Department of Architecture and Regional Planning, Indian Institute of Technology Kharagpur. He is an Architectural Engineer by profession and has more than fifteen years of teaching experience. He did his PhD on Modeling on Building Structure under Seismic Excitation in 2011. He was Worked as Principal Developer for "Developing Suitable Pedagogical Methods for various classes, intellectual calibres and learning" [Course developed: Structural System], a national project anchored by National Mission on Education through Information and Communication Technology (NMEICT) of MHRD, Govt. of India. His area of academic and research interest includes earthquake resistant building, building physics and structural systems. Recently, he had delivered an NPTEL course on Architectural Acoustics

Prof. Sumana Gupta is currently working as Assistant Professor in the Department of Architecture and Regional Planning at IIT Kharagpur since 2013. She completed her Masters degree and Doctoral Degree from the same Institute in 2008 and 2012 with a special interest in transportation planning and service quality evaluation of transport related facilities. Prior to this she worked for fourteen years as a professional architect and as a Lecturer in a Government Polytechnic College in India. She completed her Bachelor degree in Architecture in 1992 from Calcutta University. During her professional exposure as an architect she was involved in Science city auditorium design and presently offers the Building Acoustics course to the fourth year architecture students for the last four years.

COURSE PLAN :

Week 1 : Introduction to Architectural Acoustics and Building Physics: Introduction and historical overview, characteristic and measurement of sound, frequency, intensity, loudness.

Week 2 : Room Acoustics and Reverberation: Behaviour of sound in an enclosed space. Concept of reverberation and reverberation time

Week 3 : Sound Absorption: General description of acoustical materials - acoustical tiles, fiberboard, resonator absorption unit absorber, carpets, acoustical plaster, resilient packing composite materials, etc. Their use, selection criteria and construction.

Week 4 : Acoustical Criteria of Space Design: Principle of geometrical acoustics. Design criteria for speech and music, Design of Lecture hall, studio, classroom, church and Cathedral.

Week 5 : Design Principles of Auditorium: Different acoustical defects in the auditorium and its solution, acoustical correction design and modification techniques, Design of Auditorium and motion picture hall.

Week 6 : Electro- Acoustics & Open-Air Auditorium: Concept and layout of electro acoustical systems. Free field propagation of sound, Open air acoustics. Acoustics and landscape elements. Design fundamentals of open-air theatre

Week 7 : Air & Structure Borne Sound Propagation: Propagation of noise of mechanical operation and impact noise, sound transmission through wall and partition.

Week 8 : Environmental Acoustics: Type, measurement of noise, Reduction of noise by Town Planning and Regional Planning consideration.