# THESIS ABSTRACT


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| **STUDENT NAME** | **HAMID, MIR SABEER** |
| **TITLE OF THE STUDY** | **INVESTIGATING SMART CLASSROOM ACOUSTICS UTILIZING COMPUTER MODELING** |
| **MAJOR FIELD** | **ARCHITECTURAL ENGINEERING** |
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Good listening conditions are essential in classrooms. Students are greatly handicapped when the classroom acoustics are marginal or poor affecting the comprehension of delivered speech. Poor acoustical ambience affects teachers as well; talking over nosy classrooms can be exhausting to the teacher and to his or her willingness to dialogue with the students. With the evolution of new generation of classrooms referred to as 'Smart Classrooms' meant for better and interactive learning, a large number of PC's and instructional equipment are integrated into the classroom which generate noise effecting Speech Intelligibility (SI) within a smart classroom. The objective of this study is to investigate the impact of sound-absorbing material treatment on the acoustical conditions of typical classroom in-terms of material placement and absorption characteristics and at the same time, study the effect of noise generated by instructional equipment on SI. For the better understanding of the influencing acoustical parameters and the assessment of equipment noise, measurements are carried out in conventional as well computer classrooms of King Fahd University of Petroleum and Minerals, Dhahran. Supported by the results of acoustical measurements, a typical smart classroom model is simulated varying the surface treatment to achieve an overall best configuration of sound-absorbing material placement and absorption characteristics. The effectiveness of the described layout is verified, comparing it with the Acoustical Society of America (ASA) recommendations for surface treatment in typical classrooms. The impact of various Background Noise (BN) levels on SI noticed from measurements is studied by simulating the derived best configuration under various BN conditions. The results highlight the significance of surface treatment with sound absorption materials on improving smart classroom acoustics. Enhancement in speech conditions are achieved from the derived best overall configuration of surface treatment. Similar results are revealed as the formulated layouts are compared with ASA recommendations. The detrimental effect of noisy environment on SI is investigated and the necessity of standardizing noise level as per ASA specification for classroom acoustics is emphasized. The outcome of this research can be used as guidelines by educational establishments for retrofitting of existing classrooms as well as for new projects.



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