48-116: Building Physics
Units: 3
Instructor: TBD

This course is conceptually located at the nexus of “sustainability, design, and computation” with the goal of introducing fundamental theories of building physics and simulation-aided design development skill sets in the fields of building lighting and thermal performance and room acoustics. Architecture students will develop a generative knowledge base on (1) photometric principles to characterize the indoor luminous environment, (2) heat transfer mechanisms and thermodynamic principles to evaluate the thermal interactions of building spaces with outdoors, and (3) acoustical parameters of sound propagation used to define occupant’s aural comfort. The course will let students turn this knowledge base into designer insights and intuitions through simulation-aided analysis of various design strategies for the ultimate objective of creating a building space with improved performance on environmental sustainability and occupational wellbeing.

Students will leave this course with the basic understanding of the quintessential relationships between the first principle theories of building physics and environmentally responsive architectural design strategies. This will help students to develop the habit of using fundamental physics as a generator of novel design concepts. Students will also acquire a working knowledge and complete proficiency in state-of-the-art physics-based simulation programs which can be effectively utilized in future design studio courses during their undergraduate education. All the necessary skill sets targeted in this course are also readily applicable to students’ future professional design practices. The content, assignments and learning activities of the course are carefully calibrated to architecture students’ backgrounds, knowledge base, and experiences with attention to integration to the studio courses as well as current trends in architectural design (high-performance buildings and environmental sustainability, and user-centered design approaches).

The course requires basic level building design and graphic communication education and 3D modeling proficiency together with fundamental understanding of classical physics which are already possessed by the second-year students of architecture.