ARCHITECTURAL ENGINEERING (AREN)

AREN 100 Durham School of Architectural Engineering and Construction Seminar
Notes: This course can be taken multiple times.
Description: Presentation of professional problems and practices by students, faculty, and professionals associated with careers in the Durham School of Architectural Engineering and Construction.
Credit Hours: 0
Max credits per semester:
Max credits per degree:
Grading Option: Pass No Pass

AREN 101 Introduction to Architectural Engineering
Prerequisites: Corequisite AREN 100 (UNO AREN 1010)
Description: An overview of architectural engineering. Descriptions of structural, lighting and electrical, and mechanical engineered systems in buildings. Design and measurement exercises. Field visits to buildings.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded
Prerequisite for: CONE 211

AREN 103 Design and Simulation Studio I
Description: Focus on virtual modeling in the context of conceptual design. Study of fundamentals of Building Information Modeling (BIM), iterative design processes, early design analysis techniques, and technical problem-solving processes. Development of modeling skills in various software programs including Autodesk Revit, Formit, Dynamo, and Trimble Sketchup.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Prerequisite for: AREN 203

AREN 201 ARCH ENGINEERNG SMNR
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AREN 203 Design and Simulation Studio II
Prerequisites: AREN 103
Description: Focus on building systems as integral elements in architecture, building and construction assemblies, materials and methods, fabrication, and tectonic exploration using building information modeling (BIM) processes. Exposure to building construction systems, stereotomic and tectonic construction assemblies, and fundamentals of the architectural design process.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Prerequisite for: AREN 303

AREN 211 Thermodynamics for Architectural Engineering
Prerequisites: MATH 1960 (Calculus II) or equivalent; PHYS 2110 (General Physics) or equivalent.
Description: First and Second Laws of Thermodynamics, properties of gases and vapors. Sources of energy and its conversion to work. Applications on Architectural Engineering and Construction.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 225 CNST GRAPHICS & DSGN
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 240 BUILDING SYSTEMS
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 303 AE Design and Simulation Studio III
Prerequisites: AREN 203 or permission of instructor
Notes: This is the third of the four-course AE Studio series.
Description: A comprehensive focus on building design and construction through integrating program, structure, site, and enclosure aligned with architectural engineering. Topics include structure and construction assemblies; envelope performance; and whole building organization and space-making using BIM processes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Prerequisite for: AREN 403

AREN 307 MECH OF MTRLS LAB
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AREN 310 HVAC Fundamentals
Prerequisites: MECH 200; corequisite AREN 404; for students in the major, Professional Admittance into B.S. Architectural Engineering; for non-major students, instructor permission.
Description: Topics will include an introduction to the types of air conditioning systems; the properties of moist air, psychometric processes in HVAC equipment; indoor air quality; thermal comfort; heat transmission in buildings; solar radiation; and the calculation of building infiltration rates, space heating loads and space cooling loads.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AREN 404; AREN 412

AREN 312 MECH SYSTM FOR BLDGS
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 313 HVAC LABORATORY
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AREN 320 Lighting I: Fundamentals for Design
Prerequisites: ECEN 211; for students in the major, Professional Admittance into B.S. in Architectural Engineering; for non-major students, instructor permission.
Description: Introduction to illumination engineering for building interiors. Topics include the fundamentals of light and vision, lighting equipment, requirements for building lighting, and basic illuminating engineering design methods.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 322 Electrical Systems I
Prerequisites: ELEC 211; for students in the major, Professional Admittance to the B.S. Architectural Engineering program; for non-majors, instructor permission.
Description: Study of basic design of building electrical systems including circuit design, power distribution and service equipment, communications systems, and special electrical systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 323 LIGHTNG&ELEC SYS LAB
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AREN 330 Building Acoustics
Prerequisites: PHYS 212; for B.S. AE students: Professional Admittance into Architectural Engineering. For non-AREN students, instructor permission
Description: An introduction to the acoustics of buildings. Topics include the fundamentals of sound generation, propagation, and measurement; human hearing; acoustic properties of materials and constructions; basic room acoustics; and noise control.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 377 Global Experiences in Architectural Engineering
Prerequisites: Department permission.
Description: Individual or group educational experience in Architectural Engineering that combine classrooms, lectures, discussions, and/or seminars with field and/or classroom studies in a foreign country. Choice of subject matter and coordination of on- and off-campus activities are at the discretion of the instructor.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
ACE: ACE 5 Humanities

AREN 392 INDIVIDL INSTRTN III
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 394 SPECIAL TOPICS III
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 401 SR PROJECT: MECH SYS
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option

AREN 402 SR PROJECT: LIGHTING
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option

AREN 403 AE Design and Simulation Studio IV
Prerequisites: AREN 303
Notes: This is the fourth and final course in the AE studio series.
Description: Advanced topics in Building Information Modeling (BIM) are presented including modeling tools and processes for building engineers, designers, contractors, and operators. BIM management throughout the building lifecycle, technical engineering use cases, and specific topics in virtual reality, simulation, augmented reality, and graphical programming environments are covered. Advanced topics relevant to all AE fields include collaborative design and interoperability.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

AREN 404 Building Envelopes
Prerequisites: MECH 200 and junior standing; corequisite AREN 310
Description: Introduction to the fundamental concepts of heat transfer through application in building envelope thermal behavior. Implementation of concepts within the scope of energy modeling, utilizing current standard computational tools and engineering logic to assess the design and operation of high-performance building envelopes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Prerequisite for: AREN 412

AREN 412 Building Energy II: Primary and Secondary Systems
Prerequisites: AREN 310, CIVE 310 and AREN 404
Description: Analysis and design of building air distribution systems, fans, pumps, piping, space air diffusion, chillers, and boilers.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AREN 415

AREN 415 HVAC Design
Prerequisites: AREN 412/AREN 4120.
Notes: Only undergraduate students are permitted to enroll.
Description: Develop and design the mechanical system for an actual building, from the programming phase to the final construction documents.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product
Experiential Learning: Case/Project-Based Learning

AREN 420 Lighting II: Theory, Design and Application
Crosslisted with: AREN 820
Prerequisites: (UNO) AE 3200
Notes: Lab sessions include photometric measurements and computer applications.
Description: Design and analysis of lighting systems; the integration between the lighting design process and the technical foundations for building lighting; design criteria; lighting design procedures lighting modes and subjective effects; and calculation tools.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AREN 425; AREN 825

AREN 425 Lighting Design
Prerequisites: AREN 420/(UNO) AE 4200.
Description: Advanced design and analysis of lighting systems. Application of the lighting design process for advanced interior applications such as multimedia facilities, and outdoor applications such as sports lighting.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product
Experiential Learning: Case/Project-Based Learning

AREN 430 ADV NOISE CONTROL
Crosslisted with: AREN 830
Prerequisites: AE 3300 or equivalent
Description: Characterization of acoustic sources; use and measurement of sound power and intensity; sound-structure interaction; acoustic enclosures and barriers; muffling devices; vibration control; and active noise control.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 442 Healthcare Design and Construction
Crosslisted with: AREN 842, CNST 442, CNST 842
Prerequisites: Senior or graduate standing
Description: Introduction to the design and construction of healthcare facilities. Healthcare regulations and standards, infection control, interim life safety measures, code requirements, medical equipment selection and coordination, healthcare design and construction techniques, and best practices will be addressed. Provides guidance in preparation for the Certified Healthcare Constructor credential offered by the American Healthcare Association.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

AREN 460 Smart Building Sensors and Programming
Crosslisted with: AREN 860
Prerequisites: CSCE 155A
Description: Principles of modeling, interfacing and signal conditioning of sample building sensors, and acquisition of sensor data utilizing an engineering programming language such as LabVIEW and analysis of data from different types of building sensors. Overview of current sensing technology and control in buildings.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

AREN 492 INDIVIDL INSTRCTN IV
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AREN 494 Special Topics IV
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option