

AREN - ARCHITECTURAL ENGR (AREN)

AREN 200 Architectural Engineering Foundations

Credits 2. 2 Lecture Hours. Introduction to the broad field and professional practice of architectural engineering, architectural engineering systems, and the role of the architectural engineer; emphasis on professional engineering design services, design and construction processes and documents, building envelope and materials, structural systems, mechanical systems, lighting systems, building systems integration, building codes and standards, fire safety, professional attributes of architectural engineers, and issues of human performance requirements and sustainability at relates to building system design.

Prerequisite: Sophomore classification or approval of instructor.

AREN 210 Fundamentals of Building Information Modeling for Architectural Engineering

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application of the fundamentals of engineering design, document production, and interdisciplinary coordination utilizing design and drafting software; application of software to model shapes, structures, and systems in 3D with parametric accuracy, precision, and ease; topics include streamline documentation work, with instant revisions to plans, elevations, schedules, and sections as projects change; and introduction of specialty toolsets; production of structural and mechanical-electrical-plumbing systems in a 3-D model.

AREN 221 Engineering Mechanics - Statics and Dynamics for Architectural Engineers

Credits 4. 4 Lecture Hours. Principles of statics, kinematics, and kinetics, with particular attention to architectural engineering applications; general principles of mechanics; concurrent force systems; statics of particles; equivalent force/moment systems; centroids and center of gravity; equilibrium of rigid bodies; trusses, and frames; internal forces in structural members; friction; second moments of areas; force action related to displacement, velocity, and acceleration of rigid bodies; kinematics of plane motion; kinetics of translation and rotation; mass moment of inertia; vibration; work, energy, and power; impulse and momentum. **Prerequisites:** Grade of C or better in MATH 251 or MATH 253, or equivalent, or concurrent enrollment; grade of C or better in PHYS 206; grade of C or better in ENGR 216/PHYS 216 or PHYS 216/ENGR 216.

AREN 281 Architectural Engineering Seminar

Credit 1. 1 Lecture Hour. Exploration of architectural engineering and its subfields; architectural engineering curriculum resources and opportunities such as internships and research; current professional challenges and ethical implications; presentations from faculty and industry guests. **Prerequisites:** Grade of C or better in ENGR 102; admission to major degree sequence in architectural engineering.

AREN 289 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of architectural engineering. May be repeated for credit.

AREN 300 Architectural Engineering Systems

Credits 3. 2 Lecture Hours. 3 Lab Hours. Analysis and application of the engineering design process to solve problems associated with the design and operation of building systems, specifically related to HVAC, electrical power and lighting, and structural integrity; communication of solutions to technical problems of building systems, through writing, presentations, and team interactions, typical of architectural engineers in the building industry; emphasis on the engineering design process in architectural engineering, structural systems for buildings, mechanical systems for heating, ventilation, and air-conditioning, electrical lighting for buildings, building fire safety, building acoustics, building codes and standards, interface issues among different building systems, and sustainability aspects of building systems. **Prerequisites:** Grade of C or better in AREN 200 and AREN 221; or approval of instructor.

AREN 310 Thermal-Fluid Sciences for Architectural Engineers

Credits 4. 4 Lecture Hours. Fundamental theory and practical application of thermal-fluid sciences adapted for architectural engineering; conservation laws, energy conversion, thermodynamic properties, open and closed systems analysis, psychrometric analysis, vapor and gas cycles with emphasis on refrigeration cycles; fluid behavior laws; dimensional analysis for external and internal flows. **Prerequisites:** Grade of C or better in AREN 221, MEEN 221, MEEN 225, or CVEN 221; grade of C or better in MATH 251 or MATH 253.

AREN 311 Thermal-Fluid Sciences II for Architectural Engineers

Credits 3. 3 Lecture Hours. Continued theory and application of thermal-fluid sciences adapted for architectural engineering; open channel flow, pumps, conduction, convection, and radiation heat transfer; heat exchangers; introduction to computational fluid dynamics and computational heat transfer for building applications. **Prerequisites:** Grade of C or better in AREN 310 or equivalent.

AREN 320 Lighting Engineering for Buildings

Credits 3. 3 Lecture Hours. Reinforces the fundamentals of illuminating engineering for building interiors; focuses on the design and analysis of electrical lighting systems, including the integration between the lighting design process and the technical foundations of building lighting; emphasis on the fundamentals of lighting engineering and basic engineering methods for building lighting systems, lighting design criteria, lighting calculations, and power budgets. **Prerequisites:** Grade of C or better in AREN 300; or approval of instructor.

AREN 330 Mechanical Systems for Buildings

Credits 3. 3 Lecture Hours. Introduction to qualitative and quantitative engineering concepts of mechanical systems for buildings for architectural engineers, including HVAC systems, control of indoor air pollutants and fire suppression systems; emphasis on thermal behavior of buildings and building envelopes, human comfort requirements and psychometrics, thermal load calculations, HVAC systems/equipment, design of space air-conditioning and its relationship to architectural design, mechanical systems for indoor air quality and for fire suppression. **Prerequisites:** Grade of C or better in AREN 300 and AREN 310; or approval of instructor.

AREN 399 High Impact Experience for Architectural Engineers

Credits 0. 0 Other Hours. Participation in an approved high-impact learning experience; reflection on professional outcomes from the National Society of Professional Engineers' Engineering Body of Knowledge; documentation and self-assessment of learning experience at mid-curriculum point. **Prerequisite:** Junior or senior classification.

AREN 401 Architectural Engineering Design I

Credits 4. 3 Lecture Hours. 3 Lab Hours. Instruction and practice in the design process applied to an architectural engineering design project; application of establishing customer need, determining requirements in terms of function and performance, developing alternative design concepts, performing trade-off studies among performance, cost and schedule, embodiment and detail design and the iteration of the above steps; major architectural engineering design project. **Prerequisites:** Grade of C or better in AREN 330, AREN 311, and CVEN 345.

AREN 402 Architectural Engineering Design II

Credits 3. 2 Lecture Hours. 3 Lab Hours. Application and extension of fundamentals of engineering design, product detail, and design development process, including case studies; emphasis on project management, marketing considerations, manufacturing detailed design specifications, failure modes, applications of codes and standards, selection of design margins, product (component) development guidelines, intellectual property, product liability and ethical responsibility; major architectural engineering design project. **Prerequisite:** Grade of C or better in AREN 401.

AREN 430 Hygrothermal Analysis of Building Envelopes

Credits 3. 3 Lecture Hours. Heat and mass transfer on and through building envelopes; solar loads; internal heat gains; estimation of space cooling and heating loads. **Prerequisites:** Grade of C or better in AREN 310; or approval of instructor.

AREN 440 Architectural Engineering Heating, Ventilating and Air Conditioning Design

Credits 3. 3 Lecture Hours. Project-based design course; select and develop the mechanical system for a building, from the programming phase to the design development and working documents; emphasis on the application HVAC principles in the design and analysis of a mechanical system in a real building, including review of building thermal load calculations & energy analysis, HVAC design goals and schematic design, system selection and system design, HVAC design development, HVAC design documents, and energy, environmental, and human comfort considerations in HVAC design. **Prerequisites:** Grade of C or better in AREN 311 and AREN 330.

AREN 485 Directed Studies

Credits 0 to 6. 0 to 6 Other Hours. Directed individual study within architectural engineering. **Prerequisites:** Junior or senior classification and approval of architectural engineering director or delegate.

AREN 489 Special Topics in...

Credits 1 to 4. 1 to 4 Other Hours. Selected topics in an identified area of architectural engineering. May be repeated for credit. **Prerequisites:** Junior or senior classification.

AREN 491 Research

Credits 1 to 6. 1 to 6 Other Hours. Research conducted under the direction of faculty member in architectural engineering. May be repeated for credit. **Prerequisites:** Junior or senior classification in engineering and approval of the architectural engineering program delegate.