ARE - Architectural Engineering

Architectural Engineering: ARE

Lower-Division Courses

ARE 102. Introduction to Architectural Engineering.

Restricted to architectural engineering and architecture majors. Introduction to architectural engineering as a career by use of case studies. One lecture hour a week for one semester. Offered in the fall semester only.

ARE 217. Computer-Aided Design and Graphics.

Introduction to procedures in computer-aided design and computer graphics used in producing plans and three-dimensional electronic models associated with building design and construction. Three hours of lecture and laboratory a week for one semester. Prerequisite: Architectural Engineering 102.

ARE 119S, 219S, 319S, 419S, 519S, 619S, 719S, 819S, 919S. Topics in Architectural Engineering.

Used to record credit the student earns while enrolled at another institution in a program administered by the University's Study Abroad Office. Credit is recorded as assigned by the study abroad adviser in the Department of Civil, Architectural and Environmental Engineering. University credit is awarded for work in an exchange program; it may be counted as coursework taken in residence. Transfer credit is awarded for work in an affiliated studies program. May be repeated for credit when the topics vary.

Upper-Division Courses

ARE 320K. Introduction to Design I.

Introduction to design principles, concepts, and problem-solving approaches. Issues addressed by a series of two- and three-dimensional studies. Nine laboratory hours a week for one semester. Offered in the fall semester only. Prerequisite: Architectural Engineering 217, and credit or registration for Engineering Mechanics 319.

ARE 320L. Introduction to Design II.

Continuation of Architectural Engineering 320K. Focus on building design. Nine laboratory hours a week for one semester. Offered in the spring semester only. Prerequisite: Architectural Engineering 320K, and credit or registration for Civil Engineering 329.

ARE 323K. Project Management and Economics.

Solving economic problems related to construction and engineering; construction project management techniques; characteristics of construction organizations, equipment, and methods. Three lecture hours a week for one semester. Prerequisite: Civil Engineering 333T or Engineering Studies 333T, and Mathematics 408D or 408M.

ARE 129S, 229S, 329S, 429S, 529S, 629S, 729S, 829S, 929S. Topics in Architectural Engineering.

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ARE 335. Materials and Methods of Building Construction.

Elements and properties of construction materials and components; fabrication and construction technologies, methods, and processes; engineering systems characteristic of commercial buildings such as foundation, structural, and building envelope systems. Three or four lecture and discussion hours a week for one semester. Prerequisite: Civil Engineering 324P.

ARE 345K. Masonry Engineering.

Behavior and design of masonry with respect to architectural, economic, and structural criteria. Four and one-half hours a week for one semester, including lecture and laboratory. Prerequisite: Civil Engineering 324P.

ARE 346N. Building Environmental Systems.

Analysis and design of building air conditioning systems; heating and cooling load calculations, air side systems analysis, air distribution, building electrical requirements, electrical and lighting systems. Three lecture hours a week for one semester. Prerequisite: Physics 303L, 103N, and one of the following: Mechanical Engineering 310T, 316T, 320, or 326.

ARE 346P. HVAC Design.

Design and analysis of heating, ventilation, and cooling systems for buildings. Focus on application of fundamental energy and mass transfer principles to HVAC components. Three lecture hours a week for one semester. Prerequisite: Architectural Engineering 346N.

ARE 358. Cost Estimating in Building Construction.

Building construction estimating from plans and specifications, unit prices, lump sum estimates, job sites, overhead, general overhead, and bidding procedures. Estimating methods throughout the design process. Two lecture hours and three supervised laboratory hours a week for one semester. Prerequisite: Architectural Engineering 335.

ARE 362L. Structural Design in Wood.

Engineering properties of wood; design of glued-laminated and lumber structural members, connections, and simple systems; introduction to shear walls and diaphragms. Five hours of lecture and supervised work a week for one semester. Prerequisite: Civil Engineering 329.

ARE 465. Integrated Design Project.

Design of low-rise buildings, including structural and environmental systems; preparation of contract documents. Six hours a week for one semester, including lecture and laboratory. Prerequisite: Architectural Engineering 320L, 346N, credit or registration for 335, Civil Engineering 331 or 335, and 357.

ARE 366. Contracts, Liability, and Ethics.

Legal aspects of engineering and construction contracts; contract formation, interpretation, rights and duties, and changes; legal liabilities and professional ethics of architects, engineers, and contractors. Two lecture hours and two laboratory hours a week for one semester. Prerequisite: Architectural Engineering 323K.

ARE 370. Design of Energy Efficient and Healthy Buildings.

Design and analysis of sustainable buildings, envelopes and facades, and energy and resource use in energy efficient and healthy buildings. Applies building science principles used to avoid moisture problems, minimize sick-building syndrome symptoms, and reduce energy use. Three lecture hours a week for one semester. Prerequisite: Architectural Engineering 346N.

ARE 371. Energy Simulation in Building Design.

Fundamentals of building energy simulations, analytical models for heat transfer in buildings, general numerical methods for solving equations from the analytical models, use of energy simulation tools in

building design analysis, and parametric analyses used to study various operational parameters that affect energy use in buildings. Three lecture hours a week for one semester. Prerequisite: Architectural Engineering 346N.

ARE 372. Modeling of Air and Pollutant Flows in Buildings.

Fundamentals of indoor airflow modeling; use of computational fluid dynamics (CFD) for air quality and thermal comfort analyses; application of CFD for analysis of air velocity, temperature, humidity, and contaminant distributions with different ventilation systems. Three lecture hours a week for one semester. Prerequisite: Architectural Engineering 346N and Civil Engineering 319F.

ARE 376. Building Information Modeling for Capital Projects.

Focuses on the skills and information needed to effectively use an existing Building Information Model for a building construction project. In this project-based course, students gain knowledge on the implementation of BIM concepts throughout the life cycle of a building from planning and design to construction and operations. Three lecture hours and one and one-half laboratory hours a week for one semester. Prerequisite: Architectural Engineering 320L and 323K.

ARE 177K, 277K, 377K. Studies in Architectural Engineering.

Various specified topics or conference course. For each semester hour of credit earned, the equivalent of one lecture hour a week for one semester; additional hours may be required for some topics. May be repeated for credit when the topics vary. Prerequisite: Varies with the topic.

Topic 7: Independent Study. Restricted to architectural engineering majors. Independent research with a tenure track faculty member in the Department of Civil, Architectural, and Environmental Engineering. Prepare a project proposal and a final report, each of which is evaluated by the faculty supervisor. ARE 177K (Topic 7) and ARE 177K (Topic: Independent Study) may not both be counted. Additional prerequisite: Consent of instructor.

ARE 177R. Internship.

The equivalent of one lecture hour a week for one semester. May be repeated for credit. Offered on the pass/fail basis only.

ARE 377S. Emerging Technology: Survey.

Restricted to students in the Cockrell School of Engineering. Survey of building design technologies in engineering, architectural, and construction firms. Three lecture hours for one semester. Only one of the following may be counted: Architectural Engineering 377K (Topic: Emerging Technol: Tech Elec-GBR), 377K (Topic: Emerging Technol:Survey-GBR), 377S, or 377T. Offered on the letter-grade basis only. Prerequisite: Consent of Instructor.

ARE 377T. Emerging Technologies: Technical Elective.

Restricted to students in the Cockrell School of Engineering. Technical design within engineering, architecture, and construction. Three lecture hours for one semester. Only one of the following may be counted: Architectural Engineering 377K (Topic: Emerging Technol: Tech Elec-GBR), 377K (Topic: Emerging Technol:Survey-GBR), 377S, or 377T. Offered on the letter-grade basis only. Prerequisite: Upper-division standing; Architectural Engineering 320K and 320L; and consent of instructor.

ARE 679H. Undergraduate Honors Thesis.

Research performed during two consecutive semesters under the supervision of an engineering faculty member; topics are selected jointly by the student and the faculty member with approval by the director of the Engineering Honors Program. The student makes an oral presentation and writes a thesis. Individual instruction for two semesters. Students pursuing both the Bachelor of Arts, Plan II, and a bachelor's degree in engineering may use this course to fulfill the thesis requirement for the Bachelor of Arts, Plan II. Prerequisite: For 679HA, enrollment in the Engineering Honors Program; for 679HB, Architectural Engineering 679HA and enrollment in the Engineering Honors Program.

Graduate Courses

ARE 381E. Design of Energy Efficient and Healthy Buildings.

Design of buildings for low energy use and optimal indoor air quality. Includes ventilation, energy efficiency, moisture problems, and prevention by design. Three lecture hours a week for one semester. Prerequisite: Graduate standing in engineering or graduate standing and consent of instructor.

ARE 382. Independent Studies in Architectural Engineering.

Investigation of problems in building construction, selected by the student with approval of the graduate adviser. The equivalent of three lecture hours a week for one semester. May be repeated for credit when the topics vary. Offered on the credit/no credit basis only. Prerequisite: Graduate standing in architectural engineering and consent of the graduate adviser.

Topic 1: Construction and Project Management. Offered on the credit/no credit basis only.
Topic 2: Structures. Offered on the credit/no credit basis only.
Topic 3: Materials and Methods. Offered on the credit/no credit basis only.
Topic 4: Environmental Engineering. Offered on the credit/no credit basis only.
Topic 5: Design Principles and Procedures. Offered on the credit/no credit basis only.

ARE 383. Research Studies in Architectural Engineering.

Three lecture hours a week for one semester, or the equivalent in conference hours, or as stated for the topic. May be repeated for credit when the topics vary. Prerequisite: Graduate standing.

Topic 1: Construction and Project Management.
Topic 2: Structures.
Topic 3: Materials and Methods.
Topic 4: Forensic Engineering: Materials and Structures. Same as Civil Engineering 397F. Methods of forensic analysis; role of the expert witness; methods of dispute resolution; case studies; term project. Two lecture hours a week for one semester, with three laboratory hours a week for presentation of case studies.
Topic 5: Advanced Masonry Engineering. Properties of masonry, differential movement, construction operations, bearing wall systems, and case histories of failures.

ARE 389H. HVAC Design.

Design of heating, ventilation, and air-conditioning systems. Three lecture hours a week for one semester. Prerequisite: Graduate standing and three of the following courses: Architectural Engineering 346N, Civil Engineering 319F, Mechanical Engineering 320, 326, 330, 339.

ARE 389T. Indoor Air Quality: Transport and Control.

Transport and control of indoor pollutants. Includes particulate removal and pollutant transport into and within indoor environments. Three lecture hours a week for one semester. Prerequisite: Graduate standing in architectural or civil engineering.

ARE 389U. Energy Simulation in Building Design.

Restricted to architectural engineering or civil engineering graduate students. Fundamentals of building energy simulations including basic analytical models for heat transfer in building elements and general

numerical methods for solving system of equations. Use of energy simulation tools for building design analyses including parametric studies. Three lecture hours a week for one semester. Only one of the following may be counted: Architectural Engineering 383 (Topic: Energy Simulation in Building Design), 389U, Civil Engineering 397 (Topic: Energy Simulation in Building Design). Prerequisite: Graduate standing, and Mechanical Engineering 320 or three semester hours of equivalent upper-division coursework in thermodynamics.

ARE 389V. Modeling of Air and Pollutant Flows in Buildings.

Same as Civil Engineering 389V. Restricted to architectural engineering or civil engineering graduate students. Fundamentals of indoor airflow modeling, use of computational fluid dynamics (CFD) for air quality and thermal comfort analyses, application of CFD for analysis of air velocity, temperature, humidity, and contaminant distributions with different ventilation systems. Three lecture hours a week for one semester. Only one of the following may be counted: Architectural Engineering 383 (Topic: Modeling of Air and Pollutant Flows in Buildings), 389V, Civil Engineering 389V, 397 (Topic: Modeling of Air and Pollutant Flows in Buildings). Prerequisite: Graduate standing; for architectural engineering and civil engineering majors, three semester hours of coursework in fluid dynamics; for others, consent of instructor.

ARE 395P. Project Automation.

Three lecture hours a week for one semester. Some topics may require additional hours; these are identified in the Course Schedule. May be repeated for credit when the topics vary. Prerequisite: Graduate standing and consent of instructor.

Topic 1: Advanced CAD Procedures. Same as Civil Engineering 395P (Topic 1: Advanced CAD Procedures). Introduction to advanced CAD procedures and CAD systems, and their influence on building design and construction. Nine hours of lecture and laboratory a week for one semester. Additional prerequisite: An introductory CAD course.
Topic 2: Introduction to Construction Automation and Integration. Same as Civil Engineering 395P (Topic 2: Introduction to Construction Automation and Integration). Construction automation and integration activities, methods for opportunity identification and financial analysis of systems, and tools from several disciplines that are used in construction automation and integration; students prepare a project that synthesizes this information.

ARE 395Q. Project Controls.

Three lecture hours a week for one semester. Some topics require two lecture hours and three laboratory hours a week; these are identified in the Course Schedule. May be repeated for credit when the topics vary. Prerequisite: Graduate standing and consent of instructor.

ARE 395R. Project Information Systems.

Three lecture hours a week for one semester, or as required by the topic. May be repeated for credit when the topics vary. Prerequisite: Graduate standing and consent of instructor.

Topic 5: Data Mining. Same as Civil Engineering 395R (Topic 5: Data Mining). Fundamentals of data mining. Techniques for data classification, prediction, clustering, and association rules mining. Data mining as an advanced data analysis method in engineering and construction. Implementation issues.

ARE 395S. Project Organization.

Three lecture hours a week for one semester. May be repeated for credit when the topics vary. Prerequisite: Graduate standing and consent of instructor.

Topic 4: Project Management. Same as Civil Engineering 395S (Topic 4: Project Management). Overall aspects of project and portfolio management from inception to successful operation: project selection and feasibility, contracting methods, project scheduling, cost control systems, project communications, project scope and quality management, human resource management, partner selection and management, project leadership, project closeout, and global project management.

ARE 395T. Project Technology.

Three lecture hours a week for one semester. May be repeated for credit when the topics vary. Prerequisite: Graduate standing and consent of instructor.

ARE 395U. General Topics in Construction Engineering and Project Management.

Three lecture hours a week for one semester. May be repeated for credit when the topics vary. Prerequisite: Graduate standing and consent of instructor.

Topic 3: Advanced Legal Concepts. Same as Civil Engineering 395U (Topic 3: Advanced Legal Concepts). Contracts, documentation requirements, claims avoidance, and settlement of claims by alternative dispute resolution. Students conduct and present in-depth studies of the most frequent causes of claims (delay, disruption, acceleration, soil conditions, and changes) and consider the way the court establishes causation and determines damages.

ARE 698. Thesis.

The equivalent of three lecture hours a week for two semesters. Offered on the credit/no credit basis only. Prerequisite: For 698A, graduate standing in architectural engineering and consent of the graduate adviser; for 698B, Architectural Engineering 698A.

ARE 398D. Departmental Report.

Preparation of a report to fulfill the requirement for the Master of Science in Engineering degree under the departmental report option. Individual instruction. Offered on the credit/no credit basis only. Prerequisite: Graduate standing in architectural engineering and consent of the supervising professor and the graduate adviser.

ARE 398R. Master's Report.

Preparation of a report to fulfill the requirement for the master's degree under the Graduate School report option. The equivalent of three lecture hours a week for one semester. Offered on the credit/no credit basis only. Prerequisite: Graduate standing in architectural engineering and consent of the supervising professor and the graduate adviser.

Professional Courses