

Architectural Engineering (ARE)

ARE 102 Introduction to Architectural Engineering 1 Hour

Introduction to architectural engineering as a career by use of case studies.

ARE 107K, 207K, 307K Topics in Architectural Engineering 1-3 Hours

ARE 217 Computer-Aided Design and Graphics 2 Hours

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.

ARE 119S, 219S, 319S, 419S, 519S, 619S, 719S, 819S, 919S Topics in Architectural Engineering 1-9 Hours

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 Fariborz Maseeh 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.

ARE 320K Introduction to Design I 3 Hours

Introduction to design principles, concepts, and problem-solving approaches. Issues addressed by a series of two- and three-dimensional studies.

ARE 320L Introduction to Design II 3 Hours

Continuation of Architectural Engineering 320K. Focus on building design.

ARE 323K Project Management and Economics 3 Hours

Solving economic problems related to construction and engineering; construction project management techniques; characteristics of construction organizations, equipment, and methods.

ARE 129S, 229S, 329S, 429S, 529S, 629S, 729S, 829S, 929S Topics in Architectural Engineering 1-9 Hours

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ARE 335 Materials and Methods of Building Construction 3 Hours

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.

ARE 345K Masonry Engineering 3 Hours

Behavior and design of masonry with respect to architectural, economic, and structural criteria.

ARE 346N Building Environmental Systems 3 Hours

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.

ARE 346P HVAC Design 3 Hours

Design and analysis of heating, ventilation, and cooling systems for buildings. Focus on application of fundamental energy and mass transfer principles to HVAC components.

ARE 358 Cost Estimating in Building Construction 3 Hours

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.

ARE 362L Structural Design in Wood 3 Hours

Engineering properties of wood; design of glued-laminated and lumber structural members, connections, and simple systems; introduction to shear walls and diaphragms.

ARE 465 Integrated Design Project 4 Hours

Design of low-rise buildings, including structural and environmental systems; preparation of contract documents.

ARE 366 Contracts, Liability, and Ethics 3 Hours

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.

ARE 370 Design of Energy Efficient and Healthy Buildings 3 Hours

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.

ARE 371 Energy Simulation in Building Design 3 Hours

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.

ARE 372 Modeling of Air and Pollutant Flows in Buildings 3 Hours

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.

ARE 376 Building Information Modeling for Capital Projects 3 Hours

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.

ARE 177K, 277K, 377K Topics in Architectural Engineering 1-3 Hours

Various specified topics or conference course.

ARE 177K.7, 277K.7, 377K.7 Independent Study 1-3 Hours

Conduct independent research with a tenure track faculty member in the Fariborz Maseeh 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 177R Internship 1 Hour

ARE 377S Emerging Technology: Survey 3 Hours

Survey of building design technologies in engineering, architectural, and construction firms.

ARE 377T Emerging Technologies: Technical Elective 3 Hours

Technical design within engineering, architecture, and construction.

ARE 679H Undergraduate Honors Thesis 6 Hours

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.

ARE 381E Design of Energy Efficient and Healthy Buildings 3 Hours

Design of buildings for low energy use and optimal indoor air quality. Includes ventilation, energy efficiency, moisture problems, and prevention by design.

ARE 382 Independent Topics in Architectural Engineering 3 Hours
Investigation of problems in building construction, selected by the student with approval of the graduate adviser.

ARE 382.1 Construction and Project Management 3 Hours

ARE 382.2 Structures 3 Hours

ARE 382.3 Materials and Methods 3 Hours

ARE 382.4 Environmental Engineering 3 Hours

ARE 382.5 Design Principles and Procedures 3 Hours

ARE 383 Research Topics in Architectural Engineering 3 Hours

ARE 383.1 Construction and Project Management 3 Hours

ARE 383.2 Structures 3 Hours

ARE 383.3 Materials and Methods 3 Hours

ARE 383.4 Forensic Engineering: Materials and Structures 3 Hours
Methods of forensic analysis; role of the expert witness; methods of dispute resolution; case studies; term project.

ARE 383.5 Advanced Masonry Engineering 3 Hours
Properties of masonry, differential movement, construction operations, bearing wall systems, and case histories of failures.

ARE 389H HVAC Design 3 Hours
Design of heating, ventilation, and air-conditioning systems.

ARE 389T Indoor Air Quality: Transport and Control 3 Hours
Transport and control of indoor pollutants. Includes particulate removal and pollutant transport into and within indoor environments.

ARE 389U Energy Simulation in Building Design 3 Hours
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.

ARE 389V Modeling of Air and Pollutant Flows in Buildings 3 Hours
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.

ARE 395P Topics in Project Automation 3 Hours

ARE 395P.1 Advanced CAD Procedures 3 Hours
Introduction to advanced CAD procedures and CAD systems, and their influence on building design and construction.

ARE 395P.2 Introduction to Construction Automation and Integration 3 Hours
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 Topics in Project Controls 3 Hours

ARE 395R Topics in Project Information Systems 3 Hours

ARE 395R.5 Data Mining 3 Hours
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 Topics in Project Organization 3 Hours

ARE 395S.4 Project Management 3 Hours

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 Topics in Project Technology 3 Hours

ARE 395U General Topics in Construction Engineering and Project Management 3 Hours

ARE 395U.3 Advanced Legal Concepts 3 Hours
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 6 Hours

ARE 398D Departmental Report 3 Hours
Preparation of a report to fulfill the requirement for the Master of Science in Engineering degree under the departmental report option.

ARE 398R Master's Report 3 Hours
Preparation of a report to fulfill the requirement for the master's degree under the Graduate School report option.