Bachelor of Science in Architectural Engineering

Buildings are the domain of architectural engineers and endpoints of this important engineering discipline. Americans spend over 70 total years of an average lifetime inside of buildings. As such, an important role of architectural engineers is to design buildings that are structurally resilient and able to withstand the loads that act on their exterior and interior surfaces. Because of the amount of time people spend in them, it is also important that buildings be designed, constructed, operated, and maintained to be healthy environments, free of airborne or surface contamination that can adversely affect occupants. Furthermore, buildings should also be comfortable environments that facilitate worker productivity and learning. In the United States, buildings account for nearly 40% of all energy use, over 70% of electricity use, and are major contributors to greenhouse gas emissions. As such, architectural engineers strive to design, construct, and operate both energy efficient and healthy buildings, with an increasing focus on the use of appropriate green building materials and products.

The building sector represents a major fraction of the United States economy, and buildings are by far the number one asset amongst all assets in the United States. Their appropriate design is critical for the people they serve, national and global economies, and for reasons of environmental sustainability. The curriculum in architectural engineering is designed to meet these needs. It offers training in the fundamentals of engineering, with specialization in structural analysis and design, building energy and environments, building construction, and materials. This curriculum affords the student the opportunity to attain competence in the structural design of resilient buildings, from high-rise office buildings to single-family homes, and from hospitals to schools. Courses in building energy and environments provide graduates with knowledge relevant to the design and operation of both energy efficient and healthy buildings. Students will also gain important knowledge related to sustainable construction practices, construction management, and modern building materials.

The extensive technical requirements, coupled with courses in arts and sciences, provide the architectural engineering student with an opportunity to obtain a background that is ideally suited for careers and positions of responsibility with consulting engineering firms, general contractors, manufacturers, government agencies, and architecture firms. The curriculum also serves as an excellent springboard to graduate study in the areas of structural engineering, building energy and environments, construction engineering and project management, or infrastructure materials engineering.

Student Outcomes

Graduates of the architectural engineering program are expected to have

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- An ability to communicate effectively with a range of audiences
- An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Program Educational Objectives

Graduates of the architectural engineering program should solve architectural engineering problems within a greater societal context. They should:

- Exhibit character and decision-making skills embodying professionalism and ethical behavior
- Apply knowledge, strong reasoning, and quantitative skills to design and implement creative and sustainable solutions
- Engage in lifelong learning to meet evolving engineering challenges facing society
- Exhibit strong communication, critical thinking, interpersonal, and management skills as leaders and contributors in the architectural engineering profession

Dual Degree program in Architectural Engineering and Architecture

A program that leads to both the Bachelor of Science in Architectural Engineering degree and the Bachelor of Architecture degree is available to qualified students. The program combines the course requirements of both degrees and requires six years for completion. Students who wish to pursue both degrees must apply for admission to the School of Architecture according to the procedures and deadlines established by the school. The program is described in Bachelor of Architecture/ Bachelor of Science in Architectural Engineering Dual Degree Program; additional information is available from the undergraduate advisor for architectural engineering.

Portable Computing Devices

Student entering Architectural Engineering are required to have a laptop at their disposal. Laptops do not need to be brought to campus on a daily basis, but individual courses may require that a laptop be brought to class or lab sessions. For more information, see the list of minimum system requirements.

Curriculum

Course requirements include courses within the Cockrell School of Engineering and other required courses. In addition, each student must complete the University's Core Curriculum. In some cases, a course required for the Bachelor of Science in Architectural Engineering may also be counted toward the core curriculum; these courses are identified below. To ensure that courses used to fulfill the social and behavioral sciences and visual and performing arts requirements of the core curriculum also meet ABET criteria, students should follow the guidance given in Liberal Education of Engineers.

In the process of fulfilling engineering degree requirements, students must also complete coursework to satisfy the following flag requirements: one independent inquiry flag, one quantitative reasoning flag, one ethics flag, one global cultures flag, one cultural diversity in the United States flag, and two writing flags. The independent inquiry flag,

the quantitative reasoning flag, the ethics flag, the global cultures flag, and one writing flag are carried by courses specifically required for the degree; these courses are identified below. Students are advised to fulfill the second writing flag requirement with a course that meets another requirement of the core curriculum. Courses that may be used to fulfill flag requirements are identified in the Course Schedule.

Requirements		Hours
Architectural Engineering Courses		
ARE 102	Introduction to Architectural Engineering	1
ARE 217	Computer-Aided Design and Graphics	2
ARE 320K	Introduction to Design I	3
ARE 320L	Introduction to Design II	3
ARE 323K	Project Management and Economics	3
ARE 335	Materials and Methods of Building Construction	3
ARE 346N	Building Environmental Systems	3
ARE 346P	HVAC Design	3
or ARE 371	Energy Simulation in Building Design	
ARE 366	Contracts, Liability, and Ethics	3
ARE 465	Integrated Design Project (independent inquiry flag)	4
Civil Engineering		
C E 311K	Introduction to Computer Methods	3
C E 311S	Probability and Statistics for Civil Engineers (quantitative reasoning flag)	3
C E 319F	Elementary Mechanics of Fluids	3
C E 324P	Properties and Behavior of Engineering Materials	3
C E 329	Structural Analysis	3
C E 331	Reinforced Concrete Design	3
or C E 335	Elements of Steel Design	
C E 357	Geotechnical Engineering	3
Chemistry		
CH 301	Principles of Chemistry I (part II science and technology)	3
Engineering Mechanics		
E M 306	Statics	3
E M 319	Mechanics of Solids	3
Mathematics		
M 408C	Differential and Integral Calculus (mathematics; quantitative reasoning flag)	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427J	Differential Equations with Linear Algebra (quantitative reasoning flag)	4
Physics		
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
PHY 303K	Engineering Physics I (part I science and technology)	3
PHY 303L	Engineering Physics II (part I science and technology)	3
Other Required Courses		
E S 333T	Engineering Communication (writing flag; ethics flag)	3
GEO 303	Introduction to Geology	3
M E 310T	Applied Thermodynamics	3
Approved architectural history elective (visual and performing arts; global cultures flag)		3
Approved mathematics or science elective		3
Approved technical electives		9
Remaining Core Curriculum Courses		
RHE 306	Rhetoric and Writing (English composition)	3
E 316L	British Literature [1]	3
or E 316M	American Literature	
or E 316N	World Literature	
or E 316P	Masterworks of Literature	
American and Texas government [2]		6
American history [2]		6
Social and behavioral science [3]		3
UGS 302	First-Year Signature Course [4]	3
or UGS 303	First-Year Signature Course	
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1. Some sections of the listed English humanities courses (E 316L, 316M, 316N, 316P) carry a global cultures or cultural diversity flag.		
2. Some sections carry a cultural diversity flag.		
3. Some sections carry a global cultures and/or cultural diversity flag.		
4. In UGS 302, all sections carry a writing flag. In UGS 303, some sections carry a writing flag.		
Total Hours		**126**

Technical Electives

Technical electives in architectural engineering are listed in three areas of specialization below. Nine semester hours must be chosen from the following approved technical elective courses or selected with the approval of the department undergraduate advisor. Lower-division courses may not be used as technical electives.

Area 1, Structural Engineering

Architectural Engineering 345K, *Masonry Engineering*
Architectural Engineering 362L, *Structural Design in Wood*
Civil Engineering 331, *Reinforced Concrete Design* or 335, *Elements of Steel Design*
Civil Engineering 360K, *Foundation Engineering*
Civil Engineering 362M, *Advanced Reinforced Concrete Design*
Civil Engineering 362N, *Advanced Steel Design*
Civil Engineering 363, *Advanced Structural Analysis*
Civil Engineering 375, *Earth Slopes and Retaining Structures*
Engineering Mechanics 339, *Advanced Strength of Materials*

Area 2, Building Energy and Environments

Architectural Engineering 346P, *HVAC Design* or 371, *Design of Energy Efficient and Healthy Buildings*
Architectural Engineering 370, *Design of Energy Efficient and Healthy Buildings*
Civil Engineering 341, *Introduction to Environmental Engineering*

Mechanical Engineering 339, *Heat Transfer*
Mechanical Engineering 374F, *Fire Science*
Mechanical Engineering 374S, *Solar Energy Systems Design*
Mechanical Engineering 379N, *Engineering Acoustics*

Area 3, Construction and Infrastructure Materials Engineering

Architectural Engineering 358, *Cost Estimating in Building Construction*
Architectural Engineering 376, *Building Information Modeling for Capital Projects*
Civil Engineering 351, *Concrete Materials*
Mechanical Engineering 349, *Corrosion Engineering*
Mechanical Engineering 378K, *Mechanical Behavior of Materials*
Mechanical Engineering 378P, *Properties and Applications of Polymers*