ARCHITECTURAL ENGINEERING

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Department Head: Allen C. Estes

Academic Programs

Program name	Program type
Architectural Engineering	BS, Minor, MS

The Architectural Engineering Department is an integral part of the College of Architecture and Environmental Design, and it shares and supports the mission of the College. The mission of the architectural engineering program is to educate students to be successful in the practice of structural engineering. The department has several overall program objectives, which are: to advance in the profession through a combination of continuing education, graduate studies, lifelong learning and professional society participation; obtain a PE license and be working toward an SE license; communicate effectively with colleagues, clients and the public; and display leadership, initiative, creativity, teamwork, ethical behavior, work ethic and technical expertise in the chosen profession while exhibiting confidence and humility.

To eventually attain these overall program objectives, the following student learning outcomes must be satisfied. At the time of graduation, we expect our graduates to be able to: identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics; 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; communicate effectively with a range of audiences; 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; function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives; develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions; and acquire and apply new knowledge as needed, using appropriate learning strategies. To attain these outcomes, the program provides a balance of theoretical (analytical) and experimental courses.

The Architectural Engineering program carefully addresses architectural design, constructability issues, life safety and economy of construction. In addition, course projects address realistic design criteria, such as economic implications and environmental, social, ethical and sustainability issues. Using integrated design projects, modern technological tools, and the latest design codes to address these goals, the department emphasizes the advantages of a close, interdisciplinary team-based approach to design and construction.

The use of interdisciplinary projects allows students to hone their communication, critical thinking, and project management skills by working in multi-disciplinary teams. As students learn more about building design, they become cognizant of the ethical implications of design, specifically of how political and societal issues affect the engineering of the built environment, both on a local scale and on a broader international scale. These larger societal issues motivate students to engage in life-long learning, allowing them to use their skills in professional structural engineering practice.

The department's learn-by-doing philosophy is part of a pedagogy which emphasizes design-centered laboratories, integrating theory and design, culminating in a senior project capstone design experience.

The Architectural Engineering Program is accredited by the Engineering Accreditation Commission of ABET (http://www.abet.org).

Undergraduate Programs
BS Architectural Engineering

Cal Poly's Department of Architectural Engineering's (ARCE) curriculum focuses on the structural engineering of buildings. By focusing on building design students are able to take many more structural engineering courses than is possible in a traditional civil engineering program. Beyond structural engineering courses, students take several architecture and construction management courses and studios, giving them an appreciation for these disciplines.

Laptop Requirement - The department has a requirement that all students have a laptop computer. Computing is an integral component in today's engineering environment. Many Architectural Engineering classes emphasize cooperative projects / assignments, and a laptop computer provides the required mobility to facilitate collaboration. Financial aid may be available to help cover the cost of the computer laptop (contact the Financial Aid Office (http://financialaid.calpoly.edu) for more information). Refer to department website for additional information.

Architectural Engineering Minor

The minor is designed for students wishing to pursue a more in-depth education in structures. The coursework exposes students to analytical, design, and construction issues relevant to the structural design process. Students select a sequence of courses that focus on either structural design or structural analysis. The program is tailored for students majoring in architecture and construction management. Contact the department for additional information.

Graduate Program
MS Architectural Engineering

The Master of Science in Architectural Engineering (MS Architectural Engineering) program is designed for students holding an accredited degree in architectural, civil or structural engineering. For students within the Cal Poly Architectural Engineering undergraduate program, a blended BS + MS option is available. The program is designed to prepare graduates to meet the demands for practice in the structural engineering profession. Core curriculum courses expose students to emerging topics in structures, advanced methodologies to predict and analyze structural behavior, and cutting edge design procedures. Additionally, related topics in architecture and building constructability are integrated into the curriculum to create a unique interdisciplinary masters level education. Elective courses also allow individuals to advance their knowledge in technical areas offered from graduate degree programs across the campus. Candidates should refer to the “General Policies Governing Graduate Studies (https://catalog.calpoly.edu/graduateeducation/

#generalpoliciesgoverninggraduatestudiestext)" section for supplemental University requirements.

Blended BS Architectural Engineering + MS Architectural Engineering

A blended program provides an accelerated route to a graduate professional degree, with simultaneous conferring of both Bachelor's and Master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status. Students are required to complete all requirements for both degrees, including senior project for the Bachelor's degree.

A blended program is available for MS Architectural Engineering.

Eligibility

Students majoring in BS Architectural Engineering are eligible for the blended program in MS Architectural Engineering.

Participation in a blended program is based upon prior academic performance and other measures of professional promise. Refer to Graduate Education (https://catalog.calpoly.edu/graduateeducation/#graduateandpostbaccalaureateadmissionrequirements/) for more information and for the minimum criteria required to be eligible for a blended program at Cal Poly. Contact the Graduate Program Coordinator in the Architectural Engineering department for any additional eligibility criteria.

ARCE Courses

ARCE 106. Introduction to Building Systems. 2 units
Term Typically Offered: F
Sustainability Related
Introduction to building systems and materials. Use and application of structural, foundation, envelope, mechanical and electrical systems in the field of Architectural Engineering. 1 lecture, 1 activity.

ARCE 211. Structures I. 3 units
Term Typically Offered: F,W,SP,SU
Prerequisite: For ARCE majors: PHYS 141, MATH 142; for ARCH and CM majors: PHYS 121 or PHYS 141, MATH 142 or MATH 182.

Introduction to the role of structures in the making of buildings. Introduction to statics and creation of simple three-dimensional structures. Development of skills to analyze structures composed of axial force (truss) members. 3 lectures.

ARCE 212. Structures II. 3 units
Term Typically Offered: F,W,SP,SU
Prerequisite: ARCE 211 (C- or better required for ARCE Majors).

Introduction to the role of structures in the making of buildings. Introduction to shear and moment diagrams using the principles of statics and the application of the diagrams to simple three-dimensional structures. Development of skills, particularly free body diagrams, to analyze structures composed of bending (beams) members. 3 lectures.

ARCE 223. Mechanics of Structural Members. 3 units
Term Typically Offered: F, SP
Prerequisite: ARCE 212 (C- or better required for ARCE Majors).
Concurrent for ARCE majors: ARCE 224.

Advanced topics of stresses in beams. Plastic bending, unsymmetrical bending. Combined stresses. Stress transformation. Buckling. Deflection of beams. 3 lectures.

ARCE 224. Mechanics of Structural Members Laboratory. 1 unit
Term Typically Offered: F, SP
Concurrent: ARCE 223.

Experimental investigations of material properties. Experimental studies of stresses and deflections in beams, including plastic bending, and unsymmetrical bending. Stress transformations via strain gages for combined loading cases. Culminating lab experience: A student run, self-designed experiment. 1 laboratory.

ARCE 226. Introduction to Structural Systems. 3 units
Term Typically Offered: F,W,SP,SU
Prerequisite: ARCE 212.

Description, behavior and comparison of structural building systems. Concepts of structural stability, load flow, framing schemes and building configuration related to vertical and lateral loads. Not open to Architectural Engineering majors. 3 lectures.

ARCE 227. Structures III. 2 units
Term Typically Offered: F, SP
Prerequisite: ARCE 212 (C- or better required for ARCE Majors).

Continuation of selected concepts covered in ARCE 211 and ARCE 212. Advanced topics in two-dimensional and three-dimensional equilibrium of structural building systems. 2 lectures.

ARCE 257. Structural CAD for Building Design. 2 units
Term Typically Offered: W, SP
Prerequisite: CM 115.

Emphasis on the use of computer graphics software to represent a building's structural system and its individual elements. 1 lecture, 1 laboratory.

ARCE 260. History of Structures. 4 units
Term Typically Offered: W, SU
2020-21 or later catalog: GE Area C1
2019-20 or earlier catalog: GE Area C3
Social, symbolic, and technical importance of landmark structures. Analysis of breakthrough ideas that led to major advances in building design. Contextualization of these advances. Tools by which to assess and critique structural art as a separate and distinct art form. 4 lectures. Fulfills GE Area C1 (GE Area C3 for students on the 2019-20 or earlier catalogs).

ARCE 270. Selected Topics. 1-4 units
Term Typically Offered: TBD
Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

ARCE 302. Structural Analysis. 3 units
Term Typically Offered: F, W
Prerequisite: ARCE 223 and ARCE 227 (C- or better required for ARCE Majors). Concurrent for ARCE majors: ARCE 352.

Analysis of statically indeterminate structures using virtual work, slope deflection, the force method and plastic analysis methods. 3 lectures.

ARCE 303. Steel Design I. 3 units
Term Typically Offered: F, SP
Prerequisite: ARCE 223 (C- or better required for ARCE Majors). Corequisite for ARCE majors: ARCE 371. Corequisite for ARCE minors: ARCE 226.

Analysis and design of steel structural members subjected to bending, shear and axial forces. 3 lectures.

ARCE 304. Timber Design. 3 units
Term Typically Offered: W, SP
Prerequisite: ARCE 371 for ARCE majors (with C- or better); ARCE 223 and ARCE 226 for ARCE minors.

Analysis and design of timber structural members subjected to bending, shear, and axial forces. Wood diaphragms, shear walls and their connections. 3 lectures.

ARCE 305. Masonry Design. 2 units
Term Typically Offered: W, SP
Prerequisite: ARCE 371 for ARCE majors (with C- or better); ARCE 223 and ARCE 226 for ARCE minors.

Design of load-bearing walls, shear walls, columns and beams in masonry. 2 lectures.

ARCE 306. Matrix Analysis of Structures. 3 units
Term Typically Offered: F, W
Prerequisite: ARCE 302 (C- or better required for ARCE Majors). Concurrent: ARCE 353.

Analysis of statically indeterminate structures by direct stiffness method including continuous beams, plane trusses, and frames. Introduction to finite-element methods. 3 lectures.

ARCE 315. Introduction to Structural Design. 4 units
Term Typically Offered: F,W,SP,SU
Prerequisite: ARCE 226.

Introduction to structures that use timber, steel and concrete as the primary construction material. Introduction to gravity load carrying systems and lateral load resisting systems using timber, steel and concrete elements. Credit not allowed for ARCE majors. 4 lectures.

ARCE 316. Structural Integration in Architecture. 4 units
Term Typically Offered: SP
Prerequisite: ARCE 315. Concurrent: ARCH 353.

Integration of structural systems into architectural design. Preliminary design of structures including the development of gravity load carrying systems and lateral load resisting systems. Introduction to tall building and long span structural systems. Introduction to structural issues of cladding systems. Not open for major credit to Architectural Engineering majors. 4 lectures.

ARCE 352. Structural Computing Analysis. 1 unit
Term Typically Offered: F, W
Prerequisite: CSC 231 or CSC 234. Concurrent: ARCE 302.

Computer calculations, programming and technical reporting. Emphasis on use of two-dimensional structural analysis software to analyze a building's structural system and its individual elements. 1 laboratory.

ARCE 353. Matrix Structural Computing Analysis. 1 unit
Term Typically Offered: F, W
Prerequisite: ARCE 352 (C- or better required for ARCE Majors). Concurrent: ARCE 306.

Emphasis on the use of nonplanar structural analysis software to analyze a building's structural system and its individual elements. 1 laboratory.

ARCE 354. Numerical Analysis Laboratory. 1 unit
Term Typically Offered: W, SP
Prerequisite: MATH 244 and ARCE 353 (C- or better required for ARCE Majors). Concurrent: ARCE 412.

An intensive survey of numerical analysis techniques used for solving engineering problems. Topics include integration, ordinary differential equations, and the eigenproblem. 1 laboratory.

ARCE 360. Equilibrium Without Statics. 4 units
Term Typically Offered: F, SP
2020-21 or later: Upper-Div GE Area B
2019-20 or earlier catalog: GE Area B5, B6, or B7
Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; and one course in GE Area B4 with a grade of C- or better (GE Area B1 for students on the 2019-20 or earlier catalogs).

Equilibrium without statics via state of the art geometric visualization and programming. Use of a programmed drawing environment to study the flow of loads through a building. Mathematical insights into Virtual Work and both Castigliano's Theorems. Historical analysis and context. Course is offered online only. 4 Lectures. Fulfills GE Area Upper-Division B (GE Areas B5, B6, or B7 for students on the 2019-20 catalog).

ARCE 371. Structural Systems Laboratory. 3 units
Term Typically Offered: F, W
Prerequisite: ARCE 223, ARCE 227 (C- or better required for ARCE Majors), and third year standing in Architectural Engineering.

Studies in the relationship of structural framing to overall building geometry. Emphasis on the stability of structural configurations, calculation of building loads and development of a complete gravity and lateral load path. 3 laboratories.

ARCE 372. Steel Structures Design Laboratory. 3 units
Term Typically Offered: F, W
Prerequisite: ARCE 257, ARCE 302, ARCE 303, ARCE 352 and ARCE 371 (C- or better required for ARCE Majors).

Steel framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Cannot be taken concurrently with ARCE 451 or ARCE 452.

ARCE 400. Special Problems for Advanced Undergraduates. 1-3 units
Term Typically Offered: F, W, SP
Prerequisite: Consent of instructor and department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter.

ARCE 410. Integrated Building Envelopes. 4 units
Term Typically Offered: TBD
Prerequisite: Fourth year standing. Recommended: Third year design and analysis courses; ARCE 302, ARCE 372.

Multidisciplinary exploration of the value and collaboration required of an integrated project team approach to the design and construction of sophisticated building envelopes. Team taught by instructors and practitioners from each of the following disciplines: architecture, architectural engineering and construction management. 4 lectures.

ARCE 412. Dynamics of Framed Structures. 3 units
Term Typically Offered: W, SP
Prerequisite: ME 212; MATH 244; and ARCE 306 (C- or better required for ARCE Majors). Concurrent: ARCE 354.

Analysis of structures subjected to dynamic loads with single- and multi-degrees of freedom. Development of techniques for analysis of structures in response to time varying loads. 3 lectures.

ARCE 415. Interdisciplinary Capstone Project. 4 units
Term Typically Offered: F, W, SP
Prerequisite: Senior standing and consent of instructor.

Team based interdisciplinary capstone / senior project course. Analysis and evaluation of interdisciplinary challenges associated with integrating the design and construction processes to deliver a project with respect to the design, budget, schedule, quality, and performance expectations of a client. 4 laboratories.

ARCE 421. Soil Mechanics. 3 units
Term Typically Offered: F, W, SP
Prerequisite: ARCE 212 (C- or better required for ARCE Majors). Recommended: GEOL 201.

Principles of soil mechanics, including rudiments of geology, soil classification, gravimetric and volumetric relations, compaction, methods and testing, shear strength of soil and strength theories. 2 lectures, 1 laboratory.

ARCE 422. Foundation Design. 3 units
Term Typically Offered: W, SP
Prerequisite: ARCE 421 (C- or better required for ARCE Majors).

Soil-bearing capacity; sizing and design of spread footings, driven piles and drilled shafts. Design and analysis of earth-retaining structures. Analysis of the stability of slopes. 3 lectures.

ARCE 444. Reinforced Concrete Design. 4 units
Term Typically Offered: F, W
Prerequisite: ARCE 371 and ARCE 302 (C- or better required for ARCE Majors).

Theory and design of basic reinforced concrete elements: non-slender columns, beams, tee beams and one way slabs. 3 lectures, 1 laboratory.

ARCE 451. Timber and Masonry Structures Design and Constructability Laboratory. 3 units
Term Typically Offered: F, SP
Prerequisite: ARCE 257, ARCE 304, ARCE 305, and ARCE 371 (C- or better required for ARCE Majors).

Timber and masonry framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Cannot be taken concurrently with ARCE 372 or ARCE 452.

ARCE 452. Concrete Structures Design and Constructability Laboratory. 3 units
Term Typically Offered: W, SP
Prerequisite: ARCE 257, ARCE 444, and ARCE 372 or ARCE 451 (C- or better required for ARCE Majors).

Cast in place concrete framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Cannot be taken concurrently with ARCE 372 or ARCE 451.

ARCE 453. Interdisciplinary Senior Project. 1-4 units
Term Typically Offered: F, W, SP
Prerequisite: Senior standing and consent of instructor.

Interdisciplinary projects under faculty supervision that go beyond topics covered in the Architectural Engineering curriculum. Projects must include integration with other disciplines outside of structural or architectural engineering. Exemption of interdisciplinary requirement can be approved by department head on a case by case basis. Total credit limited to 4 units.

ARCE 460. Collaborative Design Laboratory. 2 units
Term Typically Offered: F, W, SP
Prerequisite: Consent of instructor.

Investigation of the collaborative nature of the design process as it relates to the architectural engineer and related disciplines Development of skills necessary to create a successful design team through the development of specific projects. Total credit limited to 4 units. 2 laboratories.

ARCE 470. Selected Advanced Topics. 1-4 units
Term Typically Offered: TBD
Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

ARCE 471. Selected Advanced Laboratory. 1-4 units
Term Typically Offered: TBD
Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

ARCE 473. Advanced Timber and Masonry Structures Laboratory. 3 units
Term Typically Offered: TBD
Prerequisite: ARCE 372, ARCE 422, ARCE 444 and ARCE 451 (C- or better required for ARCE Majors).

Emphasis on long span industrial/warehouse type buildings. Use of steel in timber/masonry construction and constructability. Holes in diaphragms, out-of-plane wall behavior and sub-diaphragms, perforated wood and masonry shear walls, pre-manufactured shear walls, masonry retaining walls, connections including post-installed anchors. 3 laboratories.

ARCE 475. Civil Infrastructure and Building Systems. 4 units
Term Typically Offered: F, W, SP
Sustainability Focused
Prerequisite: Senior standing in CE or ARCE.

Principles and practices for the sustainable design, fabrication, and installation of systems for the civil infrastructure and building; including structural, air/gas, water/wastewater, electrical, and control systems. Methods and materials used for fabrication and installation; including cost and schedule considerations. 4 lectures. Crosslisted as ARCE/CE 475.

ARCE 476. Architectural Engineering Building Systems. 3 units
Term Typically Offered: F, W, SP
Prerequisite: Senior standing in ARCE.

Principles and practices for the sustainable design, fabrication, and installation of architectural engineering building systems; including air/gas, water/waste water, electrical, and control systems. Methods and materials used for fabrication and installation; including cost and schedule considerations. 3 lectures. Not open to students with credit in ARCE/CE 475.

ARCE 483. Seismic Analysis and Design. 3 units
Term Typically Offered: F, SP
Prerequisite: ARCE 372, ARCE 412 (C- or better required for ARCE Majors).

Introduction to dynamic response analysis of building structures with emphasis on earthquake ground motion. Earthquake resistant design of buildings in accordance with building codes. Application of computer programs and physical models for seismic design. Laboratory studies utilizing physical models for studying the behavior of building structures subjected to simulated ground motions. 2 lectures, 1 activity.

ARCE 485. Cooperative Education Experience. 6 units
Term Typically Offered: F, W, SP
CR/NC
Prerequisite: Sophomore standing and consent of department head.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 12 units. Credit/No Credit grading only. Credits to not count toward graduation in the ARCE Degree Program.

ARCE 495. Cooperative Education Experience. 12 units
Term Typically Offered: F, W, SP
CR/NC
Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 24 units. Credit/No Credit grading only. Credits to not count toward graduation in the ARCE Degree Program.

ARCE 501. Advanced Structural Mechanics. 3 units
Term Typically Offered: F
Prerequisite: ARCE 306, ARCE 353.

Principles, concepts, and techniques of advanced structural mechanics. Studies of displacement, strain, stress, strain-displacement relation and constitutive models in three dimensions. Failure criteria. Introduction into energy principles and approximate solutions. 3 lectures.

ARCE 502. Nonlinear Structural Behavior I. 3 units
Term Typically Offered: F
Prerequisite: ARCE 306 and ARCE 353.

Principles, concepts, and behavior of structures loaded beyond their linear-elastic limit. Elastic-plastic behavior of truss, beam, and frame structures. Buckling and post-buckling behavior of columns. Behavior of beam-columns and the principle of superposition. Second-order elastic behavior of frames. 3 lectures.

ARCE 503. Nonlinear Structural Behavior II. 3 units
Term Typically Offered: W
Prerequisite: ARCE 502.

Principles, concepts, and techniques of nonlinear structural analysis currently used in practice. Classification of nonlinear problem types. Investigation of typical iterative solution strategies. Studies in material and geometric nonlinearities in spring, truss, and frame elements. Use of current nonlinear analysis software. 3 lectures.

ARCE 504. Finite Element Method for Building Structures. 3 units
Term Typically Offered: W
Prerequisite: MATH 244, ARCE 306, ARCE 501.

Basic concepts of equilibrium and compatibility. Stiffness and flexibility properties of various types of finite elements. Development and application of displacement and force methods. Elastic stability and dynamic response of buildings to earthquake, wind, and moving loads. Use of finite-element computer programs. 3 seminars.

ARCE 511. Structural Systems Behavior. 3 units
Term Typically Offered: SP
Prerequisite: ARCE 452, ARCE 503, ARCE 504.

Design, performance, and construction issues related to structural systems. Further development of design and analysis techniques necessary for performance based engineering of structural systems. Assessment of advantages and limitations of different structural forms and systems. 3 laboratories.

ARCE 522. Structural Systems. 3 units
Term Typically Offered: TBD
Prerequisite: Graduate standing in Architecture.

Exploration of the relationship between structural systems and architectural form. Understanding of structural stability and structural order is developed through construction of a series of small scale models. Historical perspectives are presented along with the effects of available materials and technology on structural possibilities. 3 seminars.

ARCE 546. Advanced Structural Systems. 3 units
Term Typically Offered: TBD
Prerequisite: ARCE 371 (C- or better required for ARCE Majors) or graduate standing. Corequisite: ARCE 412 or graduate standing.

Concepts and issues involved in the linear and non-linear design of complex structures including tall buildings, long-span structures and advanced seismic systems. 2 lectures, 1 laboratory. Formerly ARCE 446.

ARCE 548. Seismic Rehabilitation. 3 units
Term Typically Offered: TBD
Prerequisite: ARCE 303, ARCE 304, ARCE 305, ARCE 412, ARCE 444 (C- or better required for ARCE Majors).

Introduction to the seismic rehabilitation process and philosophy. Evaluation and analysis of existing buildings to determine expected performance due to seismic demands. Development of basic seismic rehabilitation strategies for buildings. 2 lectures, 1 laboratory. Formerly ARCE 448.

ARCE 570. Selected Advanced Topics. 1-4 units
Term Typically Offered: TBD
Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

ARCE 571. Selected Advanced Laboratory. 1-4 units
Term Typically Offered: TBD
Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

ARCE 598. Structural Engineering Design Project. 3 units
Term Typically Offered: F, W, SP
Prerequisite: Consent of instructor. Recommended: ARCE 371, ARCE 372, ARCE 452, and ARCE 483.

Independent development, research, and conclusion of a graduate project by individuals or teams specializing in the area of architectural or structural engineering. Projects may include graduate students from other disciplines. Total credit limited to 9 units.