

Architectural Engineering YAG

Two Credits | Double-Blocked Capstone | Full Year | 36 Weeks (4 Grading Periods) | Recommended Grades 11–12

Course Information: Prerequisite: Civil Engineering I. AE = §127.418 Architectural Engineering. CTE Employability Skills §127.15(d)(2) are integrated throughout. As a two-credit capstone, the course uses extended studio/lab time for a yearlong architectural engineering project that integrates engineering design, project management, building materials and methods, building envelope and MEP systems, foundations and structures, site design, sustainability/resilience, cost estimating, construction planning, technical documentation, and professional presentation. ACCESS may support postsecondary engineering pathways, credentials, career planning, and capstone portfolio development.

GP	Wks	Unit & Focus	Major Learning Tasks & Assessments	Integrated TEKS	Extension Activities
1	1–2	Unit 1 – Capstone Launch, Engineering Ethics & Design Process	• Launch the yearlong architectural engineering capstone and establish client/stakeholder needs • Apply engineering ethics defined by the Texas Board of Professional Engineers and Land Surveyors • Implement the engineering design process and analyze effects of scope, resources, ethics, regulations, technology and stakeholders • Use failure analysis and iteration as part of design improvement • Establish professional collaboration, communication and capstone documentation routines	• AE1 • AE2 • §127.15(d)(2)	• ACCESS: engineering pathways • Ethics case analysis • Capstone project charter
1	3–5	Unit 2 – Project Management, Budget & Documentation Systems	• Apply initiating, planning, executing and closing phases of project management • Define team roles/responsibilities and evaluate project-management tools • Create file naming, release-control and version-control systems • Develop requirements, constraints, deliverables, schedule and milestones • Develop/maintain a preliminary budget for materials, equipment and labor; apply management of change	• AE3 • AE2 reinforcement • §127.15(d)(2)	• Gantt/project schedule • Budget workbook • Design-team meeting
1	6–7	Unit 3 – Building Types, Forms & Programming	• Identify foundations, floors, walls, roofs and utility systems as fundamental building parts • Compare residential, commercial, institutional and industrial building types • Research the evolution of built space and building forms • Develop project program, occupancy needs and functional relationships for the capstone • Translate stakeholder requirements into preliminary design criteria	• AE4 • AE2–3 reinforcement	• Building precedent study • Programming matrix • Client review
1	8–9	Unit 4 – Building Materials, Construction Methods & Resilience	• Investigate common building and roofing materials and their applications • Compare traditional and contemporary construction methods • Examine standard construction operations and constructability • Research resilient/sustainable building materials and methods • Create a material/construction-method selection matrix for the capstone	• AE5 • AE2–3 reinforcement	• Materials investigation • Constructability study • Resilient-material trade study
2	10–13	Unit 5 – Building Envelope & Integrated MEP Systems	• Analyze exterior walls, roofs, openings, windows/doors and building-envelope performance • Identify mechanical systems including HVAC, air handling, boilers, fire protection/suppression, lifts, chilled-water equipment and emergency power • Identify electrical systems including meters, panels, branch circuits, lighting, receptacles, transformers, generators, switchgear, photovoltaics, storage and low-voltage systems • Identify plumbing systems including water/gas meters, supply/branch lines, pumps, sewer, traps, risers, water service, fire suppression and fixtures • Interpret coordinated architectural/engineering drawings and evaluate resilient/sustainable system choices	• AE6 • AE2–5 reinforcement	• MEP systems model • Drawing interpretation • Systems coordination/clash review

2	14–17	Unit 6 – Foundations, Soils, Structural Systems & Concrete	- Analyze foundation types and relationships among soil conditions, loads and building requirements - Classify soil samples and interpret soil characteristics relevant to building design - Analyze structural forces and loads including gravity, tension, compression, flexure, torsion, dead/live/environmental loads and load paths - Investigate structural systems and materials; perform concrete/material investigations as appropriate - Integrate preliminary foundation and structural decisions into the capstone building model	- AE7 - AE2–6 reinforcement	- Soils investigation - Structural/load analysis - Foundation/structure design review
2	18	Semester 1 Exam – Architectural Engineering	- Cumulative written/performance assessment - Capstone design-development review: ethics, project management, building form, materials, MEP and structures - Engineering documentation and technical presentation	- Cumulative: AE1–7 §127.15(d)(2)	Targeted review/remediation
3	19–22	Unit 7 – Site Investigation, Constraints & Sustainable Site Design	- Investigate utilities, grading, drainage, transportation access, environmental/regulatory constraints and rights-of-way - Explain Low Impact Development strategies and stormwater impacts - Evaluate soil/site conditions and locate/orient the building appropriately - Determine site features including parking, entrances/exits, pedestrian/accessibility routes and stormwater facilities - Develop preliminary and advanced CAD/BIM site drawings integrating site constraints	- AE8 - AE2–3 reinforcement	- Site investigation - LID/stormwater study - Site-design critique
3	23–27	Unit 8 – Integrated Building Engineering Design Development	- Coordinate site, architectural, structural, mechanical, electrical and plumbing systems - Apply codes, constraints and project requirements to resolve interdisciplinary conflicts - Integrate resilient/sustainable materials, construction methods and utility systems - Incorporate energy-conservation strategies and defend engineering decisions - Advance the capstone from schematic design through coordinated design development with stakeholder reviews	- AE2–8 §127.15(d)(2)	- BIM coordination - Interdisciplinary design review - Industry mentor feedback
4	28–30	Unit 9 – Construction Quantities, Cost Estimating & Bid Analysis	- Determine surface area, volume and other quantities for building components - Develop material quantity takeoffs - Develop an opinion of probable cost for the capstone project - Create/analyze bid tabulations with item descriptions, quantities, units, unit prices & totals - Compare cost, sustainability/resilience and project requirements to refine design decisions	- AE9 - AE3 reinforcement §127.15(d)(2)	- Quantity takeoff - Cost estimate/OPC - Bid tabulation
4	31–32	Unit 10 – Construction Documents, Project Manual & Construction Planning	- Document sustainable/resilient construction criteria in project deliverables - Interpret and organize construction project manual components and specifications - Verify bid/cost items against construction documents - Develop an organizational chart and construction Gantt chart - Plan construction sequencing and communicate management-of-change implications	- AE9–10 - AE3 reinforcement	- Project manual - Construction schedule - Constructability review
4	33–35	Unit 11 – Architectural Engineering Capstone Completion & Professional Defense	- Finalize coordinated site, architectural, structural and MEP design documentation - Complete technical drawings/models, material selections, quantities, cost information and construction planning - Evaluate the project for functionality, constructability, sustainability/resilience and stakeholder requirements - Conduct a formal multidisciplinary design review and revise based on evidence/feedback - Prepare a professional portfolio and defend the capstone solution through oral, written and visual communication	- AE1–11 §127.15(d)(2)	- Professional design jury - Capstone portfolio - ACCESS: postsecondary transition
4	36	Semester 2 Exam & Architectural Engineering Capstone Showcase	- Cumulative written/performance assessment - Final capstone documentation and coordinated building-system evaluation - Professional presentation, reflection and stakeholder showcase	- Cumulative: AE1–11 §127.15(d)(2)	Stakeholder/industry showcase

Architectural Engineering TEKS Coverage Checklist

Coverage verification: Every student expectation in §127.418 is intentionally addressed through direct instruction and/or the yearlong architectural engineering capstone. The capstone repeatedly integrates the standards rather than treating building systems as isolated topics. CTE Employability Skills §127.15(d)(2) are integrated throughout.

Strand	Knowledge & Skills Focus	YAG Placement	Coverage
AE1	Engineering ethics	Unit 1; reinforced throughout	100%
AE2	Engineering design process	Units 1–11 / capstone	100%
AE3	Project management	Units 2, 7–11 / capstone	100%
AE4	Building types and forms	Unit 3; capstone application	100%
AE5	Building materials and construction methods	Unit 4; Units 8–11 reinforcement	100%
AE6	Building envelope and integrated building systems	Unit 5; Units 8 and 11 reinforcement	100%
AE7	Foundations, soils, structures and materials analysis	Unit 6; Units 8 and 11 reinforcement	100%
AE8	Building site design and site constraints	Units 7–8; capstone application	100%
AE9	Construction quantities, estimating and bid/cost analysis	Units 9–10; capstone application	100%
AE10	Construction-phase planning and documentation	Unit 10; capstone application	100%
AE11	Integrated architectural engineering project/capstone application	Units 8–11 and final showcase	100%
CTE Employability	§127.15(d)(2)	Integrated throughout	100%

Implementation Notes

- Architectural Engineering is a two-credit course recommended for Grades 11–12 with Civil Engineering I as the prerequisite. The double-block schedule should be used intentionally for extended design studio, CAD/BIM, investigation, modeling, analysis, documentation, critique, and capstone work.
- The yearlong capstone should function as the organizing structure for the course. Each content unit should produce a usable project deliverable so students progressively build a coordinated architectural engineering package rather than completing disconnected projects.
- Students should experience interdisciplinary coordination among site, architectural, structural, mechanical, electrical, and plumbing systems, with repeated attention to constructability, cost, sustainability/resilience, stakeholder needs, documentation control, and professional ethics.
- Industry engagement is strongly encouraged through design juries, mentors, site/facility investigations, higher education partners, engineering organizations, CTSOs, and authentic reviews of student work. ACCESS may be used for postsecondary and career planning.
- Weeks 18 and 36 are reserved for cumulative semester exams. No instructional unit crosses the semester boundary, and no calendar-specific dates are included.