



CE 490: Senior Civil Engineering Design I

Term: Fall 2026

Credits: 3.0

Seminar Times & Location: Tuesday & Thursday 2:30–3:45 p.m., Lovell Hall 320

Modality: In-Person Seminar

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Instructor Information

- **Instructor:** Dr. Samir Rashid (Associate Professor of Civil & Environmental Engineering)
- **Email:** srashid@university.alkimi.ai
- **Office:** Rowan Engineering Center 308
- **Office Hours:**
 - Tuesday & Friday: 11:30 a.m.–1:00 p.m. (In person, Rowan Engineering Center 308)
 - Wednesday: 2:00–3:00 p.m. (Virtual via Zoom; link posted in Canvas)
 - Also available by appointment.

Course Description

First semester of the capstone design sequence: site assessment, alternatives analysis, codes and permitting, cost estimating, and a preliminary design report for a client project. CE 490 is the first course in the two-semester senior civil engineering capstone design sequence. Working in student consulting teams on authentic client-sponsored infrastructure projects, students perform comprehensive site investigations, evaluate environmental and regulatory permitting constraints, generate and screen multi-disciplinary alternatives, and prepare preliminary engineering designs. Emphasizing professional licensure, the ASCE Code of Ethics, and industry standards, the semester culminates in a 30% preliminary design drawing package, cost estimate, and formal Preliminary Design Review (PDR) presentation.

Prerequisites

CE 301, CE 310, CE 320, and senior standing.

Measurable Student Learning Outcomes

Upon successful completion of CE 490, students will be able to:

1. **Perform Infrastructure Site Assessments:** Analyze existing site conditions, topographical GIS surveys, utility infrastructure, and geotechnical data to define project site constraints and development opportunities.
2. **Evaluate Regulatory and Permitting Frameworks:** Identify and apply applicable local zoning ordinances, environmental regulations (NEPA, Clean Water Act, NPDES stormwater permits), and building codes (IBC, ASCE 7).
3. **Execute Multi-Criteria Alternatives Analysis:** Develop competing infrastructure alternatives across structural, geotechnical, water resources, and transportation domains, evaluating solutions using formal decision matrices.

4. **Prepare Preliminary Engineering Drawings and Estimates:** Generate 30% civil engineering drawing sets using AutoCAD Civil 3D, perform material quantity takeoffs, and develop preliminary construction cost estimates using RSMeans.
5. **Apply Professional Ethics and Deliver Reviews:** Adhere to the ASCE Code of Ethics regarding public safety and environmental stewardship, and present defensible preliminary engineering designs before clients and professional engineers.

Required Course Materials & Approximate Costs

1. **Grigg, Neil S. *Civil Engineering Practice in the Twenty-First Century: Knowledge and Skills for Design and Management*. 2nd ed., ASCE Press, 2012.** Approx. \$60 digital purchase (\$90 print; reserve copies available in Alkimi Library).
2. **AutoCAD Civil 3D, ArcGIS Pro, and RSMeans Online Data (available on university engineering workstations).** Free educational access provided through university engineering licensing.
3. **Total estimated cost:** Approx. \$0 (library reserve & campus software) to \$60 (textbook purchase).

Generative AI Policy (AI Level 2: AI Permitted with Disclosure for Specified Tasks)

In accordance with Alkimi University Academic Policies (Student Handbook §5.8), CE 490 operates under **AI Level 2**.

- **What is permitted:** Students may use AI tools to assist in researching federal, state, and local permitting statutes, drafting document outlines, formatting quantity takeoff spreadsheets, and refining technical prose.
- **What is prohibited:** AI models must not be used to fabricate site assessment data, generate structural sizing calculations without engineering derivation, invent environmental impacts, or create unverified AutoCAD drawing sets. All engineering analyses must reflect original student calculations.
- **Disclosure:** Each submitted project milestone and the final 30% design submittal must include an explicit AI disclosure statement listing any AI tools used, the exact queries submitted, and the professional verification steps taken to confirm code compliance and engineering accuracy.

Grading Components and Weights

- **Team Charter & Project Scoping Report:** 10% (Due Friday, September 11 at 11:59 p.m.)
- **Site Assessment & Environmental Permitting Package:** 15% (Due Friday, October 2 at 11:59 p.m.)
- **Alternatives Analysis & Preliminary Engineering Evaluation:** 15% (Due Friday, October 23 at 11:59 p.m.)
- **Preliminary Design Review (PDR) Presentation:** 20% (In class, Thursday, December 3)
- **Project Management, Client Standups & Peer Evaluation:** 15% (Evaluated through biweekly team sprint updates, client meeting minutes, and confidential peer reviews)
- **Preliminary Design Report & 30% Engineering Drawing Package:** 25% (Due by the end of the final exam period, Thursday, December 17, 2026, 1:00–3:00 p.m.)

Grading Scale (Alkimi University Standard)

- **A:** 93–100% | **A-:** 90–92%
- **B+:** 87–89% | **B:** 83–86% | **B-:** 80–82%
- **C+:** 77–79% | **C:** 73–76% | **C-:** 70–72%
- **D+:** 67–69% | **D:** 60–66% | **F:** Below 60%
- **Extra credit:** No extra credit assignments are available in CE 490.

Course Schedule (Fall 2026)

Week	Dates	Topics & Readings	Assignments & Deadlines
Week 1	Aug 27	Capstone Overview and Client Project Launch: Course scope and expectations, presentation of client infrastructure projects (municipal, commercial, environmental), and multidisciplinary team formation procedures. <i>Reading: Grigg Ch. 1–2</i>	<i>First day of classes: Wed Aug 26.</i>
Week 2	Sep 1, 3	Project Management and Consulting Engineering Practice: Consulting engineering workflows, work breakdown structures (WBS), project scheduling, quality control protocols, and drafting team charters. <i>Reading: Grigg Ch. 3–4</i>	<i>Wed Sep 2: Add/section change deadline.</i>
Week 3	Sep 8, 10	Site Assessment and GIS Infrastructure Mapping: Desktop site reconnaissance, reviewing historical maps, topography, boundary surveys, existing utilities, and submitting the Team Charter (due Friday). <i>Reading: Grigg Ch. 5</i>	<i>Mon Sep 7: Labor Day (no classes). Wed Sep 9: Census date (last day to drop without a W). Team Charter & Project Scoping Report due Fri Sep 11 at 11:59 p.m.</i>
Week 4	Sep 15, 17	Environmental Regulations and Permitting: NEPA environmental impact statements, Clean Water Act Section 404 wetland permitting, EPA NPDES stormwater construction permits, and municipal zoning ordinances. <i>Reading: Grigg Ch. 6</i>	—
Week 5	Sep 22, 24	Alternatives Generation Across Civil Sub-Disciplines: Formulating alternative concepts integrating structural framing, geotechnical foundation types, stormwater detention sizing, and access roadway geometry. <i>Reading: Grigg Ch. 7</i>	—
Week 6	Sep 29, Oct 1	Multi-Criteria Decision Analysis and Alternatives Selection: Developing weighted evaluation matrices, life-cycle cost considerations, stakeholder preferences, and submitting the Site Assessment Package (due Friday). <i>Reading: Grigg Ch. 8</i>	Site Assessment & Environmental Permitting Package due Fri Oct 2 at 11:59 p.m.
Week 7	Oct 6, 8	Building Codes and Consensus Design Standards: International Building Code (IBC), ASCE 7 structural loadings, ACI 318 concrete, AISC 360 steel, and AASHTO highway design standards. <i>Reading: Relevant building code extracts</i>	—
Week 8	Oct 15	Engineering Ethics, Licensure, and Public Welfare: ASCE Code of Ethics, the paramountcy of public health, safety, and welfare, professional engineering (PE) licensure paths, and whistleblowing case studies. <i>Reading: ASCE Code of Ethics and case studies</i>	<i>Oct 12–Oct 13: Fall break (no classes).</i>
Week 9	Oct 20, 22	Preliminary Engineering Calculations and Sizing: Preliminary sizing of structural members, stormwater retention ponds, and pavement sections; Alternatives Analysis Report due Friday. <i>Reading: Grigg Ch. 9</i>	Alternatives Analysis & Preliminary Engineering Evaluation due Fri Oct 23 at 11:59 p.m.
Week 10	Oct 27, 29	Cost Estimating and Quantity Takeoffs: Unit cost methods, earthwork cut-and-fill takeoffs, RSMeans cost databases, contingency allowances, and preliminary project budget formulation. <i>Reading: Grigg Ch. 10</i>	—
Week 11	Nov 3, 5	Constructability Review and Construction Phasing: Evaluating site access, crane staging, utility relocation sequencing, and Maintenance of Traffic (MOT) plans for roadway and utility work. <i>Reading: Grigg Ch. 11</i>	<i>Fri Nov 6: Last day to withdraw (W) or elect Pass/No Pass.</i>
Week 12	Nov 10, 12	Infrastructure Sustainability and Resiliency: Envision infrastructure rating system, LEED for neighborhood development, flood resilience, stormwater retention, and climate adaptation strategies. <i>Reading: Envision system guidelines</i>	—
Week 13	Nov 17, 19	Engineering Drawings and Specifications: AutoCAD Civil 3D plan-and-profile sheets, typical cross-sections, structural	—

Week	Dates	Topics & Readings	Assignments & Deadlines
		framing plans, and CSI MasterFormat standard technical specifications. <i>Reading: Grigg Ch. 12</i>	
Week 14	Nov 24	Quality Assurance and CE 491 Implementation Roadmap: Internal peer QA/QC review protocols, constructability checklists, client presentation planning, and setting milestones for detailed spring design in CE 491. <i>Reading: Grigg Ch. 13</i>	<i>Nov 25–Nov 27: Thanksgiving break (no classes).</i>
Week 15	Dec 1, 3	Preliminary Design Review (PDR) Presentations: Formal oral design defense presented to client sponsors, faculty evaluators, and licensed professional engineers from the advisory board. <i>Reading: Review PDR presentation rubrics</i>	Preliminary Design Review (PDR) Presentation (in class).
Week 16	Dec 8	Review Feedback Integration and Final Submittal: Revising drawings, resolving reviewer critique comments, obtaining client sign-off, and archiving the comprehensive 30% preliminary design package. <i>Reading: Review reviewer feedback comments</i>	<i>Wed Dec 9: Last day of classes. Thu Dec 10: Reading Day.</i>
Finals	Dec 17	Preliminary Design Report & 30% Engineering Drawing Package due by the end of the scheduled final exam period, Thursday, December 17, 2026, 1:00–3:00 p.m.	No final examination.

Course Policies

Attendance Policy

Punctual attendance at all seminar sessions, team progress meetings, and client briefings is mandatory. Civil capstone teams operate as professional engineering consulting practices; missing meetings harms team momentum and project deliverables. If an illness or approved professional interview travel arises, notify Dr. Rashid and your team members in advance. Students who miss the first two class meetings without notifying the instructor may be dropped. Students may miss class for religious observance without penalty if they notify the instructor in writing within the first two weeks of the semester (by Wednesday, September 9, 2026). Absences for university-sponsored activities (athletics, performances, conferences) are excused with a letter from the sponsoring office at least one week in advance.

Late Work Policy

Deliverables must be submitted on time to maintain the consulting project schedule. Late team milestones will incur a 10% penalty per 24 hours up to 48 hours late, after which submissions are not accepted without prior written instructor consent. Preliminary Design Review presentations cannot be rescheduled.

Final Exam Policy

CE 490 has no final examination. The preliminary design report & 30% engineering drawing package takes its place. Nothing is due on Reading Day (Thursday, December 10, 2026).

Academic Integrity

Alkimi University is an academic community devoted to rigorous scholarship, open intellectual inquiry, and uncompromising ethical conduct. All students are subject to the regulations of the Alkimi University Academic Integrity Policy. Academic dishonesty—including plagiarism, cheating on examinations, unauthorized collaboration, fabrication of empirical data, and unauthorized submission of academic work generated by artificial intelligence—undermines the integrity of the university and carries severe disciplinary sanctions. Sanctions range from a failing grade on an assignment or exam to an administrative course failure recorded as an 'XF' on the official transcript, academic suspension, or expulsion. Suspected violations are formally investigated and resolved through the Office of Academic Integrity in accordance with Faculty Handbook §6. For detailed information, consult the Office of Academic Integrity, Lovell Hall 315, (555) 555-0163, integrity@university.alkimi.ai.

Accessibility Services

Alkimi University is committed to providing equitable educational access and reasonable accommodations for all students with documented disabilities, including physical, sensory, psychological, learning, and chronic health conditions. Students requesting academic accommodations must formally register with the Office of Accessibility Services, Harlan Hall 204, (555) 555-0155, access@university.alkimi.ai. Once approved, students will receive an official Faculty Accommodation Letter detailing approved accommodations. Students should present this letter to the instructor as early in the semester as possible, and at least one week prior to any exam or assignment requiring accommodation. Accommodations cannot be applied retroactively.

Student Wellness and Mental Health

Your physical health, psychological well-being, and mental health are essential to your academic success. If you experience heightened stress, anxiety, depressive symptoms, personal trauma, or academic burnout, free, confidential counseling and medical care are available through the Hollis Health & Counseling Center, located in the Hollis Center. Routine appointments are available Monday–Friday 8:00 a.m.–6:00 p.m. and Saturday 10:00 a.m.–2:00 p.m. during the semester by calling (555) 555-0190 or emailing health@university.alkimi.ai. Urgent, 24/7 crisis psychological counseling is accessible immediately at (555) 555-0199.

Campus Student Support Services

- **Academic Advising Center:** Lovell Hall 101 | (555) 555-0158 | advising@university.alkimi.ai
- **Writing Center:** Whitcombe Library 3rd Floor | Free consultations on papers, reports, and research projects at any stage.
- **Whitcombe Library:** Whitcombe Library, Main Floor | (555) 555-0170 | askalibrarian@university.alkimi.ai
- **Hollis Health & Counseling Center:** Hollis Center | (555) 555-0190 | 24/7 Counseling Line: (555) 555-0199 | health@university.alkimi.ai
- **Civil Engineering Design Studio:** Rowan Engineering Center 140 | Dedicated civil computing lab with AutoCAD Civil 3D, ArcGIS, and large-format plotters open weekdays 8:00 a.m.–10:00 p.m.