UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 498 CE – Construction Equipment & Methods – Fall 2025

Instructor:	Ernest-John Ignacio
Office:	2110 Newmark Lab
E-mail:	eignaci2@illinois.edu

Office Hours:	Mondays 3:30pm to 4:30pm (NCEB 2110)
Class Hours:	Mondays & Wednesdays 2:00pm to 3:20pm (NCEB 1310)
Course Websites:	canvas.illinois.edu (Course Documents)
	mediaspace.org (Lecture Recordings)
Prerequisites:	Construction Engineering (CEE 320) or Graduate Student status

Course Description:

Designed to introduce students to specific building construction means, methods, and equipment required to complete each phase of construction. The class will be broken down into different construction divisions/phases. Students will review multiple types of projects for each phase of construction to understand the different equipment, techniques, and manpower that are used for the same tasks among different projects. Each topic will include on and/or off campus case studies to illustrate the international, national, and local application of each topic. The goal is that the course is to combine: 1) lecture material; 2) student analysis, presentation and feedback; and 3) individual study to educate students on the interaction between equipment, trades, and materials critical to construction management.

Reference Materials:

Allen, Edward and Iano, Joseph., 2019 “Fundamentals of Building Construction Materials and Methods”, John Wiley & Sons. Hoboken, New Jersey.

Engineering News-Record. A weekly magazine that provides news, analysis, data, and opinion for the construction industry worldwide.

ASCE Journal of Construction Engineering and Management. Hard copies are available in Grainger Engineering library. Online access is available at https://www.library.illinois.edu.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 498 CE – Construction Equipment & Methods – Fall 2025

Course Objective:
Enable students to apply engineering fundamentals and analyses to the planning, selection, and utilization of construction equipment. Thorough understanding of: (1) the total construction process from the early conceptual design through decommission, (2) the effect of design decisions on construction means and methods, and (3) how construction equipment should be selected and used to produce the intended quality in the most cost-effective manner.

Main Topics/Phases of Construction:

- **Introduction (5%):** Course requirements, introduction of construction equipment, history of construction equipment, development of construction equipment, effect of technology advancement on construction equipment. Case study: Pyramid of Giza. Campus case studies: Education Building and Wassaja Hall.
- **Mobilization (5%):** Notice to proceed work, establishing site boundaries for safety and security, installation methods and equipment. Case study: Kraft Heinz expansion. Campus case studies: Newmark Yeh Center expansion and State Farm Center renovation.
- **Site work (5%):** Documenting existing site conditions, performing site surveys, analyzing civil drawings, locating utility services, and conducting site visits. Case study: Single family home construction.
- **Excavations (10%):** Planning for excavation operations including target depth, required equipment, site logistics constraints, and creating haul roads for material and spoils. Review of soil states: bank, loose, and compacted soil, and how they affect equipment selection, number of trucks, and weight capacity of trucks and travel routes. Case study: Newmark Yeh Center excavation.
- **Foundations (10%):** Installation methods for shallow vs deep foundations. Preparing temporary construction such as earth retention, managing risk of deep foundations, and setting crane and elevator foundations. Staging material on site, sequencing foundations and phasing of excavation, formwork, rebar, and concrete. Concrete conveyance equipment such as mixer trucks, buckets, conveyors, and pumps. Case studies: Putzmeister at Burj Khalifa, and Osman Gazi Bridge.
- **Superstructure (10%):** Delivery and staging of superstructure components, protection of material, connecting to foundations and substructure. Steel erection and concrete construction process, crane selection and ownership, lifting risks and liability. Coordination and safety with other on-site personnel, crane awareness, connection and erection safety, and coordination with subsequent trades. Campus case study: Newmark Yeh Center superstructure.
- **Exterior Cladding (10%):** Basic definitions and explanation of common exterior cladding options. Different components for each type of cladding, transportation methods, and drawing details. Manufacturing, transportation, storing, staging, rigging, lifting, securing, installation, and cleaning methods for each cladding type and material selected. Productivity impacts and sequencing of exterior cladding installation. Case study: Beekman Tower and Aqua. Campus case study: Newmark Yeh Center cladding and North Quad Parking Structure.

- **Building Envelope (10%):** Introduction to building envelope, function of each component to achieve a complete thermal and moisture barrier, sealing and flashing envelope to prevent moisture intrusion. Roofing systems for pitched and flat roofs, common roofing materials and systems, installation methods, roof drain details and sloping. Glass curtain wall systems, sequence of installation, required equipment, staging with progress, and coordination with other trades. Campus case study: Newmark Yeh Center curtainwall and green roof.
- **Mechanical Systems (10%):** Heating, ventilation, and cooling components required for commercial and residential construction. Equipment required for installation of components. Most common heating and cooling systems. Phasing of work, roughing-in distribution elements, trim-out terminal units, and testing and balancing of system components. Campus case study: Newmark Yeh Center BIM Mechanical model
- **Electrical Systems (5%):** Review of basic electrical formula (ohms law), electric power generation in the US and Illinois. Transmission of power through a grid, to a building, and throughout a building. Required components and equipment for installing electrical systems, distribution elements, trim-out and specialized units, and testing of components. Campus case study: Newmark Yeh Center first floor electrical plan.
- **Plumbing & Fire Protection (10%):** Aquifers in Champaign and Illinois, effect of sediment and minerals on plumbing systems and equipment. Tapping water mains and required equipment, water main to building interface, servicing buildings. Water riser diagrams, plumbing risers, and identifying long-lead items. Campus case study: Newmark Yeh Center plumbing system and restroom detail.
- **Interior Finishes (5%):** Aesthetic and functional interior building components, different materials, installation methods, and functions. Campus case studies: Newmark Yeh Center interiors and Smith Football Performance Center interiors.
- **Demobilization and Closeout (5%):** Performing punch list inspections, final tests, certificates of occupancy, turn-over of building, and closeout paperwork.

Grading:

Item	Three Credit Students	Four Credit Students
Class Participation	5 points	5 points
Assignments	10 points	10 points
Exam 1 (Oct 20)	25 points	25 points
Midterm Presentation (Oct 27)	10 points	10 points
Term Project (Dec 05)	20 points	20 points
Fourth Credit Project Addition (Dec 05)	N/A	33 points
Exam 2 (Dec 08)	30 points	30 points
Total	**100 points**	**133 points**

Term Project Description:
Utilizing the knowledge gained throughout the semester, groups of four to six self-selected students will create a multi-phase construction plan for an existing building on the University of Illinois at Urbana-Champaign campus. Additional details can be found in the Term Project handout supplied in Lecture TP1 – Term Project 1.

Course Schedule:

CEE 498 Construction Equipment & Methods - Fall 2025			
#	**Day**	**Date**	**Topic**
1	Mon	25-Aug	L01 Outline
2	Wed	27-Aug	L02 Introduction
3	Mon	1-Sep	**NO CLASS - LABOR DAY**
4	Wed	3-Sep	**Guest Lecture - Trotter and Associates**
5	Mon	8-Sep	**Guest Lecture - RockSol Consulting**
6	Wed	10-Sep	**NO CLASS - CAREER FAIR**
7	Mon	15-Sep	L03 Mobilization
8	Wed	17-Sep	L04 Excavation
9	Mon	22-Sep	L05 Foundation
10	Wed	24-Sep	L06 Foundation
11	Mon	29-Sep	L07 Superstructure Basics
12	Wed	1-Oct	L08 Superstructure Erection
13	Mon	6-Oct	L09 Superstructure Connections
14	Wed	8-Oct	L10 Superstructure Coordination
15	Mon	13-Oct	L11 Exterior I
16	Wed	15-Oct	**Exam 1 Review Lecture**
17	Mon	20-Oct	**Exam 1**
18	Wed	22-Oct	L12 Exterior II
19	Mon	27-Oct	L13 Envelope I
20	Wed	29-Oct	L14 Envelope II
21	Mon	3-Nov	L15 Mechanical Systems
22	Wed	5-Nov	**NO CLASS - IGNACIO AT CONFERENCE**
23	Mon	10-Nov	L16 Mechanical Coordination
24	Wed	12-Nov	L17 Plumbing and Fire Protection
25	Mon	17-Nov	L18 Electrical Systems
26	Wed	19-Nov	L19 Electrical Coordination
27	Mon	24-Nov	**Thanksgiving**
28	Wed	26-Nov	**Thanksgiving**
29	Mon	1-Dec	L20 Interior Finishes
30	Wed	3-Dec	**Final Exam Review Lecture**
31	Mon	8-Dec	**Exam 2**
32	Wed	10-Dec	**NO CLASS**