GEORGIA INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 6125

CONSTRUCTION INDUSTRY BEST PRACTICES

FALL 2022

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Office Hours: F 4 am-6 pm. At all other times, only by appointment

MEETINGS: Fridays 12-4 pm. Please see the schedule table below for more detailed information.

LOCATION: Mason 3133

WEB PAGE: The Construction Industry Institute (CII) website will be used to distribute the course-related materials.

1. Online education courses web page: https://ciibpc.learnupon.com
2. Pre-reading materials web page: https://ciibpc.learnupon.com/learner_resource_list

COURSE DESCRIPTION: It will explain the best practices developed by the Construction Industry Institute (CII) and how they are implemented by the leading owners and contractors in the construction industry. Guest lecturers include construction industry subject matter experts.

Full Description: This course will discuss the current issues in the construction industry and introduce the best practices defined and developed by CII research over the last 30+ years. To address these subjects, the course covers a substantial amount of material. No textbooks will be used. Preparatory readings (i.e., primarily research summaries and reports) and online assessments will be available through the CII's website. Students are expected to have read the related reading material ahead of the class. Online education modules will also be arranged via CII's website to reinforce learning. The course is taught face-to-face to one class with a simultaneous live broadcast to the other participating

universities. During the lectures, many interactive group discussions with given scenarios will be made among participating universities.

Participating Universities (not limited to): Arizona State, Clemson, Florida International, Georgia Tech, Michigan-Ann Abor, Missouri S&T, NC State, Stevens, U of Houston, UT Austin, Virginia Tech, and Vanderbilt.

Participating Industry Speakers (not limited to): Bechtel, Bentley, Burns & McDonnell, Chevron, Dow, ExxonMobil, Fluor, Jacobs, KBR, Kiewit, Matrix Services, Pathfinder, SBM Offshore, Southern Company, and Trillium.

PREREQUISITE: *None*

COURSE OBJECTIVES: The objectives of the courses include:

1. To obtain and practice the knowledge of the best practice techniques with real-world exercise cases. The 17 best practices include:
    1) Advanced Work Packaging
    2) Front End Planning
    3) Alignment
    4) Constructability
    5) Materials Management
    6) Modularization
    7) Lessons Learned
    8) Benchmarking & Metrics
    9) Change Management
    10) Project Risk Assessment
    11) Implementation of CII Research
    12) Teambuilding
    13) Planning for Startup
    14) Zero Accident Techniques
    15) Partnering
    16) Quality Management
    17) Disputes Prevention & Resolution
2. To solve real-world project issues by utilizing a single or combination of multiple best practice techniques;
3. To apply teambuilding techniques to conduct team assignments;
4. To develop interpersonal communication skills among participating multi-universities;
5. To learn why and how companies can benchmark capital projects;
6. To identify the practical and proactive risk management process;
7. To identify dispute resolution and claims avoidance techniques;
8. To understand scope development, agreement formation, and project control of changes;
9. To describe the Six (6) Elements of an Effective Quality Management Systems;

10. To recognize the value of teamwork to project success;
11. To identify approaches to safety leadership;
12. To identify factors critical to the success of modularization; and
13. To identify the elements that comprise a pro-active, integrated material management process.

COURSE OUTCOMES: By taking this course, students will be able to:

1. Broaden the understanding of the critical issues and changes in the construction industry;
2. Detect when and which best practice techniques can be used to resolve the real-world construction issues;
3. Develop a proper risk mitigation and evaluation plan;
4. Recognize the key features of an effective change management system;
5. Drive a mindset that material management is much more than just purchasing;
6. Determine if modularization is suitable for their project or not;
7. Apply enhanced site safety, quality, and planning in project management; and
8. Apply the best practices to improve construction project performance through a better decision-making process.

GRADING:

Grade components will be weighted as follows in the computation of the final course grade:

Attendance and Participation	15%
In-class Online Quiz	20%
Online Educatinoal Modules Assessment	35%
Final Team Report	30%
TOTAL	100%
Attendance	-2% per day for unexcused absence or late

The correspondence of letter grade to numerical grade is:

Percentage	**Grade**
90.0-100	A
80.0-89.99	B
70.0-79.99	C

60.0-69.99	D
59.99 or lower	F

CLASS SCHEDULE (2021)- Tentative:

Class	Date	Topics	*Class Hours (51 hrs)	Presenters/company
1	8/26/2022	Course introduction	1	Dr. Cho
2	9/2/2021	Front End Planning	4	Sandra MacGillivray, Valency
3	9/9/2021	Implementation of CII Research and Lessons Learned	4	Andrew Couch, SBM Offshore TBD
4	9/16/2021	Risk Assessment and Disputes Prevention & Resolution	4	Steve Cabano, Pathfinder
5	9/23/2021	Constructability	4	Doug Omichinski, Bechtel
6	9/30/2021	Advanced Work Packaging	4	TBD, DCW Jamie Gerbrecht, ExxonMobil
7	10/7/2021	Planning for Startup	4	Edward McDaniel, Jacobs
8	10/14/2020	Change Management	4	Carmel Glumac, Kiewit
9	10/21/2021	Alignment, Partnering, and Team Building	4	Tannis Liviniuk, Trillium Group
10	10/28/2021	Materials Management	4	Jeff Houtz, Fluor Mike Reid, Dow
11	11/4/2021	Planning for Modularization	4	Mike Kluck, KBR
12	11/11/2021	Quality Management and Benchmarking & Metrics	4	Tammy Lynam, Burns & McDonnell Katy Johansson, ExxonMobil
13	11/18/2021	Zero Accidents Techniques	4	Jack Frost, Matrix Services Rich Hoffer, Chevron
14	12/02/2021	Group project presentation	2	Dr. Cho

*Schedules for the course topics can be changed.

**Class hours (4) include 3 breaks (total 40 minutes).

<u>Important Days:</u>

- October 29: Withdrawal deadline
- November 1: Group Project Proposal Deadline (12 pm EST)
- Nov. 23-25: Thanksgiving recession

- December 1: Final report deadline (12 pm EST)

COURSE ASSIGNMENTS AND EVALUATIONS:

There will be several sessions presented this semester that include CII **Online Education (OLE) Modules**. The following shows tentative modules.

- *Front End Planning*
- *Constructability*
- *Planning for Start-up*
- *Change Management*
- *Alignment, Partnering, and Team Building*
- *Planning for Modularization*
- *Zero Accident Techniques*

The modules include a summary of reading materials, case studies, and tests.

Before accessing the Online Modules, each student will need to register with the CII Website. It is important for the students to use the Georgia Tech email address when they register on the site – this will help CII to expedite the website registration connection as quickly as possible

Oline Education Module (OLE) and Quiz Schedule

Class	Topics	Required Reading	Optional Reading	Required Assessment	
1	Course introduction				
2	Front End Planning	RS113-1 RS213-1 SP268-3	IR113-2 v5 IR213-3	OLE213 Quiz	
3	Implementation of CII Research andLessons Learned	RS246-1 IS31-1 *Implemt Case Study* RS230-1	RS246-1a RS246-1b IR246-2 v1.2IS31-2 IR230-2	Quiz	
4	Risk Assessment and Disputes Prevention & Resolution	SP181-3 RS210-1 RS280-1 RS23-1 *Risk Power Case Study*	IR181-2 v2 IR210-2 IR210-3 IR23-2	Quiz	

5	Constructability	RS34-2	SP34-1 v2	OLE34-A OLE34-B Quiz	OLE34-C OLE34-D
6	Advanced Work Packaging	RS272-1 v2.1 RS319-1	IR272-2 v3.1 IR319-2	Quiz	
7	Planning for Startup	RS121-1 RS312-1	IR121-2 IR312-2	OLE121-A OLE121-B Quiz	
8	Change Management	RS43-2 RS158-1	SP43-1	OLE43 Quiz	
9	Alignment, Partnering, andTeam Building	RS310-1 RS102-1 RS37-1	IR113-3 v2.1 IR102-2 IR105-2 v2	OLE113 OLE102-A Quiz	OLE102-B OLE102-C OLE102-D
10	Materials Management	RS257-1 *MM Case Study*	IR257-2 IR257-3	Quiz	
11	Planning for Modularization	RS283-1	IR283-2	OLE283 Quiz	
12	Quality Management andBenchmarking & Metrics	RS254-1 RS308-1 RS320-1 PAC2016-4 PAC2018-2	IR254-2 IR308-2 IR320-2	Quiz	
13	Zero Accidents Techniques	RS160-1 RS301-1 RS317-1 RS321-1	RS32-1 RS216-1 RS284-1 RS293-1	OLE32-A OLE32-B Quiz	OLE101 OLE284 OLE293
14	Final Group Project Presentation				

There will be **NO** midterm or final exam. Instead, there are a number of tests, including pre-test and post-tests for each online education module and quizzes. A test score will be provided after completing each education module **(Pass: >=80)**. Passing grade will give the full credits (100%) for the module assessment (e.g., 85 points=100%; 75 points = 75%). Students must complete the online education modules **no later than 7 days after the session**. Late completion can be turned in up to 1 week late. Otherwise, it is considered unacceptable. Late completion will be graded with a maximum score of 85%, and the grade will be prorated based on the length of the delay. Note that each education module could be taken multiple times.

Quizzes:

There will be an in-class quiz for each class regarding the lecture, which needs to be completed and submitted at the end of each class. Unlike online education module tests, there is no passing grade in quizzes.

Group Projects

There will be ONE group term paper (Final project) required. Students will submit a term paper on implementing two of the Best Practices discussed in this course. See Page 9 for the final group project guideline.

Class Participation and Attendance:

It is important that you are familiar with the course materials as the course evolves. Your ability to answer questions and discuss the material will be a part of the overall participation evaluation. Therefore, you should review class materials ahead of time. Regular attendance is expected. Each student is responsible for all materials and administrative instructions given during the lecture period. Each excused absence requires prior approval (before class begins) followed by proofing materials. Also, using a cell phone, tablet, computer (working other than the class activities), talking, sleeping, listening to music, or eating during the class is inappropriate, discourteous, and inexcusable and will negatively affect the participation grade. The instructor reserves the right to adjust the course letter grade based on individual attendance and class participation per the "GRADING" section as warranted.

PERSONAL EMERGENCY:

If you have an illness or personal problems that will affect your performance during the course of the semester, please let the instructor know as soon as possible and report it to the Office of the Dean of Students. "After the fact" notification is unacceptable unless there are extreme circumstances. The Office of the Dean of Students can assist students with documented emergencies by contacting professors on behalf of the student. For more information, please call the Office of the Dean of Students at404-894-6367, or complete the Request Assistance Form. (https://gatech-advocate.symplicity.com/care_report/)

Academic Integrity:

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic

Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities:

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also email me as soon as possible in order to set up a time to discuss your learning needs.

Fall 2022 Final Project Guideline

Fall 2022 Final Project is to be completed in teams of 2-3 students. Detailed instructions are listed below. A proposal due is on **November 1, 2022**, the final report is due on **December 1, 2022,** and the group presentation will be on **December 5, 2022.**

Problem Statement:

The objective of this Final Project is to apply the model outlined in the CII Implementation Model to implement one or two of the CII Best Practices for a given scenario. See the example scenario in the next page- ALM Solutions Project Delivery System (PDS).

Instructions: *Final Project Milestones, Deliverables, and Deadlines*

1. Study the example ALM Solutions Final Project Scenario (below) and read through the CII Best Practices Handbook (SP 166-4, which can found in your required reading section for "Implementation of CII Research" on the CII website).
2. Form a **Best Practice Corporate Implementation Champion Team** with the currently assigned your class team and allocate tasks to the team members.
3. **Create your own Final Project Scenario** (similar to the sample example) that your team will study. The idea of scenario can be obtained either from real construction companies (preferred), news articles, or online cases.
4. Select **one or two** CII Best Practice(s) that your team proposes to adopt for your PDS and develop your Best Practice Implementation Proposal – the business case ("vision") that considers the needs of the organization and the opportunities and the potential impact that implementation of the CII Best Practice you have selected will have for your team's solutions (2 pages maximum). Deadline for submitting the Best Practice Implementation Proposal with a created scenario to Canvas: November 1, 2022, noon.
5. Write the **Final Paper** to outline how your team will implement the selected CII Best Practice(s). Your plan should consider the following:

    - The 4 Implementation Steps:
        - Step 1: Preparing

    - Step 2: Initiating
    - Step 3: Growing
    - Step 4: Establishing
- The Implementation Elements:
    - Focus
    - Task
    - Barriers
    - Strategies
    - Success
- Implementation Specifics:
    - Communication
    - Buy-in
    - Resources
    - Measuring Improvements

(See IR 246-2-The Implementation Planning Model: Steps to Success included in the required reading section for more information about the implementation of CII Practices)

The final paper shall be at least four (4) pages in length, but no more than eight (8) pages and include any necessary flow charts and matrices to support your implementation effort.
You are encouraged to discuss your outline with industry sources before submittal.

Sample Final Project Scenario

ALM Solutions is a new company formed through the joining of 3 different organizations: Able Construction, Lester A&E, and Mekanix.

Able Construction has a reputation for profitability. A hard-driving construction only organization based in Chicago, it was built on lump sum work throughout the United States. It has an appetite for relative high-risk projects as it seeks double digit profit margins on work executed by strong construction managers. Current ALM Chairman, Bill Mitchell, built the Able Construction organization from the ground up, handpicking his staff. He believes in the power of leadership and avoids hard and fast corporate procedures. He is a hands-on chairman. Able Construction has been an active member of CII for the past 20 years.

Lester A&E, a fee for service well respected architectural and engineering firm located in Seattle, Washington, has enjoyed a reputation for solid engineering from its 98% registered professional staff. It has a well-established clientele that looks to Lester for well-designed projects that are awarded, nearly always, on a cost-reimbursable basis. Lester has developed a delivery process that ensures high-value engineering and design with a customer-focused approach. Each project obtains the involvement of department managers who assign staff as they deem necessary. Most of its clients prefer the design-bid-build approach. Lester A&E is a new CII member, having just joined two years ago – they have not yet been able to participate in many of the CII events, nor have they begun to implement CII practices in their organization.

Mekanix, a manufacturer of process equipment, is a century-old firm specializing in US Government sector work. It delivers US assembled equipment that originates from its globally deployed manufacturing sites. It is well versed in compliance with US Federal Acquisition Regulations. Risk averse, it has succeeded through a disciplined, centrally controlled financial system. It is well financed with little debt thanks to its strong corporate accountants and auditors. Cost centers are independent but report directly to the home office in Bedford Falls. Mekanix is not a member of CII.

The newly formed entity, ALM Solutions, is engaged in engineering, procurement, and construction and commissioning (EPCC) services of oil production and refining facilities and will be seeking to capture a major share of the US market as the recession lifts. It envisions leveraging the excellent competence and reputation from each of the firms and envisions delivering fast track, turnkey, lump-sum projects at various locations throughout the world. The new company wants to grow rapidly but knows that without formal processes and systems in place, the likelihood of losing control of projects is high. The first order of business will be to establish the Project Delivery System (PDS) for the entity. Of note, ALM Solutions has recently received a new EPCC contract for an offshore oil production facility in the US Gulf of Mexico.

In this hypothetical scenario, you have just graduated from Georgia Tech and joined ALM Solutions as a member of their CII Best Practice Corporate Implementation Champions Team. Your team is charged with the identification and implementation of CII Best Practices for the ALM Solutions PDS.