

# Construction Industry Institute (CII) Best Practices Course for Construction Management Programs

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The Construction Industry Institute (CII) is an organization whose membership is comprised of more than 100 leading owner, engineering, contractor, and supplier firms. CII works with its membership to develop an industry driven research agenda which results in the development of “Best Practices” to address critical issues facing the construction industry. In 2007, CII started to offer a course about those Best Practices. In the four offerings of this course to multiple universities, the authors’ university has been one of the few that is affiliated with the Associated Schools of Construction (ASC). Given this, the purpose of this paper is to bring awareness to the ASC community about this course. This paper discusses the CII Best Practices course and its unique features that make it different from the traditional courses offered in construction management programs. Within this context, the paper presents the logistics of the course, the course content, the method for evaluating student performance, and the student feedback received to date. Given the benefits experienced by the authors’ university by incorporating this course into its curriculum, it is highly recommended that other ASC member schools consider participating in the future offerings of this course, at least on an experimental basis.

**Key Words:** The Construction Industry Institute, construction education, distance learning, graduate education

## Introduction and Background

The Construction Industry Institute (CII) was established in 1983 to improve the cost effectiveness of the capital facilities industry from early project conception and front-end planning through project completion and start-up. More than 100 leading owner, engineering, contractor, and supplier firms comprise CII’s membership. CII works with its membership to develop an industry driven research agenda and then solicits proposals from academia for the execution of this research agenda. Upon selection of qualified academic researchers, CII member companies participate on research teams with the academics to develop solutions to critical issues facing the construction industry. As part of this knowledge creation process, research teams also develop implementation resources to assist member companies and industry with the implementation of findings.

With more than 30 universities involved in the CII funded research program, the program is unique in the engineering and construction industry. The research results lead to the development of the “Best Practices” for the entire construction industry to implement to improve project success (CII, 2010a). CII defines “Best Practices” as the processes or methods that, when executed effectively, leads to enhanced construction project performance. These “Best Practices” have long been implemented by the CII member companies and proven to be very effective (CII, 2010b).

Following the tragic on campus shooting in April 2007, CII reached out to the VirginiaTech community in an effort to show its support. VirginiaTech and CII’s Executive Committee decided that if CII could teach its research findings related to the “Best Practices”, it would provide the students with tremendous insight into the workings of the construction industry. As a result, in Fall 2007, CII offered the CII Best Practices course at VirginiaTech as a 3-credit graduate course.

After the value that was being offered to the students was realized at the conclusion of the course, what was originally thought to be a one-time course offering became a regularly scheduled Fall semester course. Furthermore, CII decided to offer this course to other universities as well using distance learning via live videoconferencing as the

method of delivery. Since 2007, the number of participating universities has grown. In 2008, 5 universities participated. In 2009, 12 universities participated. In 2010, 9 universities participated.

Lectures are delivered by industry speakers who discuss their real world experiences in implementing CII Best Practices. The interaction that occurs in the classroom and after class sessions between the industry speakers and the students has been greatly valued by the students.

## **Purpose**

The authors' university participated in the course in 2009 and 2010. The authors of this paper are the course's Instructor of Record (as explained later in this paper) and two students, both of whom have taken the CII Best Practices course. As such, all three authors had a first-hand experience with this course. Furthermore, all three realized the breadth of knowledge that is brought to the classroom and recognized the positive experiences had by students through learning from industry leaders.

Over the course of the CII Best Practices course's four offerings, the authors' university has been one of the few that is affiliated with the Associated Schools of Construction (ASC). Most of the participating universities are represented by construction engineering programs housed under the civil engineering departments. The content of the course (as discussed in a subsequent section entitled "Course Content") is well-suited to be taught to construction management students without engineering backgrounds as well. This course offers material to students that is not offered in the traditional class settings. Through this course, students get a chance to interact with leaders in the industry who are delivering this course. Furthermore, students get to learn how CII Best Practices are implemented in a real world setting within the companies of those industry leaders. All of these led the authors to believe that this course offers educational opportunities that other ASC member universities should benefit from.

Given this, the purpose of this paper is to bring awareness to the ASC community about the CII Best Practices course. As such, this paper discusses the CII Best Practices course and its unique features that make it different from the traditional courses offered in construction management programs. Within this context, the paper presents the logistics of the course, the course content, the method for evaluating student performance, and the feedback from the participating students that has been received to date.

## **Course Logistics**

Since 2009, the CII Best Practices course has been hosted by CII at the University of Texas at Austin and is broadcasted to all participating universities through the use of Adobe Acrobat Connect and live videoconferencing. The Adobe Acrobat Connect component is used to deliver the PowerPoint presentation to all participating universities. The videoconferencing component allows for interaction between the presenter and the students in the participating universities as well as interaction between the students from different universities. The minimum technical specifications required for the videoconferencing system are as follows: (i) Internet Protocol (IP) or Integrated Services Digital Network (ISDN) endpoint and (ii) Reliable network with connection speeds of 384 kilobyte or above. The preferred technical specifications are: (i) IP endpoint and (ii) Dedicated 1 megabyte connection for videoconferencing. It is important to note that these specifications do not constitute very high end technical requirements; most university campuses across the nation have connection capabilities that meet these requirements.

In 2009, the authors' university was able to successfully install high quality video projectors, high definition audio, and high definition videoconferencing capabilities for \$22,000 in the classroom designated for this course. One of the benefits of this system is the ability to view multiple streams simultaneously. In addition to watching the lecturer present material in real time and interacting with the lecturer using wireless microphones, the students are able to view the PowerPoint slides that are being presented as well as the classrooms of participating universities. Examples of how these technologies are being put to use are shown in a series of figures as follows: Figure 1 presents the ability of students to view the instructor as well as other participating universities. Figure 2 presents the ability of students to view the presenter, other participating universities, and the PowerPoint slides simultaneously. Figure 3 presents a student asking a question to the presenter via wireless microphone. All questions posed by participating universities can be heard by the presenter as well as the other participating universities.



Figure 1: The presenter and the other participating universities.

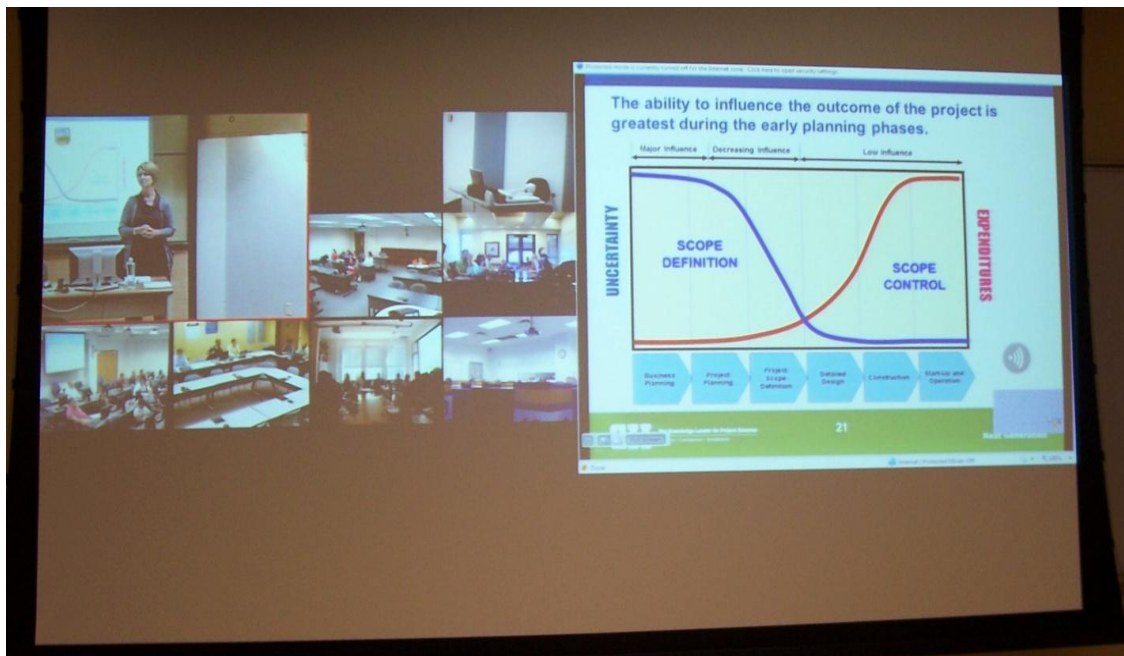


Figure 2: The presenter, other participating universities, and PowerPoint slides.



*Figure 3:* A student asking a question to the presenter via wireless microphone.

CII is responsible for providing the content and the industry presenters for the course. Each participating university designates an “Instructor of Record” who assumes the responsibility of overall course administration in their respective university. Specific responsibilities of an Instructor of Record are listed below:

- Developing the course syllabus.
- Establishing the course grading policy.
- Grading the student’s work for the class project (as will be discussed later in this paper).
- Making sure that curriculum requirements are met in their respective university.
- Distributing to students the class materials (e.g., lecture slides, preparatory reading materials, and class exercise materials) when made available from CII.
- Being present during the whole class time in order to supervise the students during class exercises and address any technical issues with microphones, speakers and the video system.
- Holding office hours as required.
- Identifying and reserving the appropriate classroom with videoconferencing capability.
- Setting up the connection 15 minutes before the class start time and schedule the connection to end 15 minutes past the class ending time.

Before the semester begins, CII organizes a number of conference calls with the Instructors of Record to discuss the course issues and plan for the semester. During the semester, CII continuously communicates with the Instructors of Record to discuss issues and to obtain feedback related to the course period.

The amount of interaction between the participating universities is designed to be substantial. This is made possible through class exercises that are designed to create healthy competition among the participating universities. Students from each university are able to interact with their peers in other universities, gaining exposure to other ideas and methods of approaching various tasks and problem solving techniques. Figure 4 presents such an instance where participating universities interact with each other.

It is important to note that a video of each class period is made available from a designated website shortly after each class. The video is intended for students registered who were unable to attend the regularly scheduled class period.

Although CII promotes this course as a graduate course, the authors’ university opened the course to juniors and seniors who have completed the prerequisite course “Construction Contracts and Project Administration.” This decision was made to ensure that the juniors who were about to start their internships, and seniors who were about to graduate and start working, would be exposed to the CII Best Practices and champion those in the companies they will work for. Furthermore, this was done to promote interaction between the undergraduate and graduate students through class participation and group work. Typically, undergraduate and graduate students do not get the chance to

interact with each other and this course provided a platform for that at a professional level. This has turned out to be beneficial especially for the undergraduate students as they get a chance to learn about the graduate program from their peers. The authors' university also opened the course to civil engineering majors and further promoted cross-department interaction.



Figure 4: Students during a class exercise, interacting with students from other participating universities.

## Course Content

As discussed earlier, CII defines “Best Practices” as the processes or methods that, when executed effectively, leads to enhanced construction project performance (CII, 2010b). CII has developed fourteen Best Practices that have long been implemented in the construction industry. Ten of these Best Practices are presented to the students in ten four-hour long class sessions. In addition to these ten sessions, the first session in the semester constitutes an introduction to the course that educates the students on the benefits of implementing CII research and Best Practices in the industry. Each session is taught by an executive of one of the CII member companies. The following is a list and brief description of the ten Best Practices covered in the CII Best Practices course (CII, 2010b; CII, 2010c):

1. Zero Accident Techniques: Site-specific safety programs and incentive efforts to create a project environment and a level of training that promotes the mindset that zero accident is an obtainable goal.
2. Front End Planning: The process of developing important information which the owners use to address risk and make decisions to commit resources in order to assure a successful project.
3. Alignment: The state where all project participants are working together to develop and meet a uniformly defined set of project objectives.
4. Constructability: The effective and timely integration of construction knowledge into the all phases of a construction project to achieve the overall project objectives in the best possible time and accuracy at the most cost-effective levels.
5. Change Management: The process of incorporating a balanced culture of recognition, planning, and evaluation of project changes to effectively manage those changes.
6. Materials Management: The process to ensure that the appropriate quality and quantity of materials and equipment are specified in a timely manner, are obtained at a reasonable cost, and are available when needed during the construction project.
7. Lessons Learned: The program that facilitates the continuous improvement of processes and procedures and provides a direct advantage in the competitive construction industry.
8. Project Controls: The system that identifies real-time various leading indicators that could be early warning signs in a construction project.
9. Equitable Risk Allocation: The framework for contracting parties to assess and allocate risk through a cooperative and non-controversial contracting relationship.



10. **Benchmarking and Metrics:** The process of measuring an organization's performance against recognized industry leaders for the purpose of determining best practices that lead to superior performance in the construction industry.

All of the above Best Practices have been implemented by CII member companies in their projects. The member companies who provide their executives to present the Best Practices to the students include Bechtel, Fluor URS, KBR, Chevron, JMJ, Ford Bacon & Davis, S&B, ConocoPhillips, Mustang Engineering, Eli Lilly, WorleyParsons, JBEC, and Ameren. The Best Practices presented during the semester are selected by CII. Input and recommendations made by the students and faculty during the semester regarding course topics are taken into account by CII when preparing the course content for the following semesters.

### **Method for Evaluating Student Performance**

The method for evaluating student performance has 3 components that relate to items that need to be completed in three different phases: (i) Before class, (ii) During class, and (iii) After class. These components are discussed in the subsequent sections.

#### *Items to be Completed by the Students Before Class*

Students are required to go through the assigned readings provided by CII, complete the CII Best Practices online education module and take the associated online exam prior to each class session. These modules and exams are available at CII's website and each student is provided with a username and password to access CII's members-only website. Each online module requires the student to engage in a series of interactive activities related to the upcoming session's Best Practice topic. Figure 5 presents a snapshot of the CII online module related to "Change Management". Figure 6 presents a snapshot of the interactive component of the "Change Management" online module. Each online exam tests the student on the associated Best Practice topic. The purpose of these "Before Class" activities is to motivate students prepare for the topic that is to be discussed in the upcoming session.

#### *Items to be Completed by the Students During Class*

During the class sessions, students are evaluated based on their ability to answer questions and discuss the course material as requested by the presenters. As discussed earlier, there are many class exercises held during a typical session. Given this, the purpose of this "During Class" participation requirement is to encourage students interact with the presenter as well as the students from other participating universities. The students are evaluated and graded on participation based on their willingness to participate during class discussions and their ability to take part in class exercises based on their preparation for the class. During the class periods, the Instructor of Record observes the students and assigns participation grades using a rubric. On the first day of class, students are informed of possible ways of participating (that the Instructor of Record will note) such as asking questions, answering the questions posed by the instructors, answering the questions posed by the other students, initiating a discussion, participating in a discussion, rephrasing other students' questions that the instructors seem to misunderstand, rephrasing the instructors' questions that other students seem to misunderstand, and letting the instructors know when they are going too fast.

#### *Items to be Completed by the Students After Class*

Once all the CII Best Practices are discussed, and towards the end of the semester, students are required to complete a class project. The class project, which is based on the following scenario, has two equally weighted deliverables, a paper and a presentation as discussed subsequently.

**Scenario:** The student is a recent graduate and has joined a small private contractor (50 employees). The contractor is engaged in design and construction activities of K-12 facilities. The owner of the company wants to grow his company rapidly, but knows that without formal processes and systems in place, the probability of losing control of projects is high.

**Deliverables:** Within the context of this class project, students are required to work in groups of two to (i) write a paper discussing how they would address the design and deployment of formal processes encompassing two of the CII Best Practices discussed in class and (ii) prepare a presentation discussing the approach taken and present it to

the class. The students are encouraged to discuss the approach they are taking with industry representatives, specifically with the speakers who taught the particular CII Best Practices that they are assigned to work on. This promotes a dialogue between the students and industry representatives; this networking has the potential to result in internship or job offers for the students as will be discussed later in this paper.

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**Dynamics of Change Management**

Change-created dynamics can be complex and are frequently underestimated.

[Fundamental project elements](#) affect (and are affected by) change and Change Management activities.

Effective Change Management is needed during all project phases. The Change Management process utilized should be appropriate for the project phase, the degree of definition that exists (at the time of the change) and the type of contract agreement/risk allocation that is in place.

Change affects project execution in ways both direct and consequential. Direct impacts accrue to the work package(s) directly affected by the change.

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Figure 5: Snapshot from the “Change Management” online module.

**Which Form and by Whom?**

In this course we have discussed several assessment forms. Drag the appropriate form to its user.

Form Type	User	Description
Scope Control Self Assessment Form		Project Teams and Corporate use this form to measure the scope of a change and the resulting impact.
Change Management Form		Project Teams use to score how the project is managing project change; Corporate uses to assess effectiveness of overall approach to change management.
Project Change Management Self-Assessment Form		Project Teams use to assess effectiveness of the project's scope control process.

Submit    Retry

Close Window

Figure 6: Snapshot from an interactive component of the “Change Management” online module.

## Student Feedback

Student feedback from the two offerings of the course in the authors' university has been very positive. Student surveys administered at the conclusion of the course in Fall 2009 and Fall 2010 at the authors' university revealed that students liked the fact that the course is delivered by industry executives with significant real world experience on the Best Practice topics that they teach. Students also concurred that the unique delivery format of the course and the use of technology did not get in the way of teaching and learning; and that they were willing to participate in class discussions even if it meant talking to a microphone and listening to their instructors and peers through

speakers. A few students indicated that four-hour long class sessions were too long and that there was some inconsistency in the delivery between different weeks as some instructors were significantly better than the others. Another issue pointed out by a few students was that there was some overlap between different sessions and thus some information was repetitive.

Some of the quotes taken from the student evaluations which highlight the unique features of this course include: “It gives you a sense of real life projects done by some of the best companies,” “It is a high level course that will help students to be stronger construction managers by utilizing CII’s Best Practices,” “There was a lot of industry and real life experience”, and “I learned a lot about preconstruction planning and how to manage it effectively better than in any other course offered here.” These quotes are indicators that students value the opportunity to interact with the industry leaders. Some other quotes that attest to the overall satisfaction of students with the course are as follows: “One of the best classes in the undergraduate program,” “This course should be a required course,” and “I will use what I learned throughout my career.”

## Conclusions

The purpose of this paper is to bring awareness to the ASC community about the CII Best Practices course offered by CII. As such, this paper discussed the CII Best Practices course and its unique features that make it different from the traditional courses offered in construction management programs. Within this context, the paper presented the logistics of the course, the course content, the method for evaluating student performance, and the feedback from the participating students that has been received to date.

The Instructor of Record’s experience with this course has been very positive. The course is designed to require a minimal amount of time commitment from the Instructor of Record. Given that the course content and delivery is provided by CII, there is no class preparation time that needs to be committed (as would be required in traditional courses) by the faculty of the participating universities. Furthermore, class readings, online education modules, and online exams are also provided by CII, again significantly reducing the time commitment of the faculty. The specific items that need to be performed by the “Instructor of Record” are not time consuming and were discussed in the section entitled “Course Logistics.” Given this, incorporating the CII Best Practices course into the curriculum is an effective way of enriching the curriculum of construction management programs across the nation.

The student feedback presented in the previous section suggests that the students’ experience with this course has also been positive and that students benefitted from this course. Students value the opportunity to interact with industry leaders as well as their peers in other participating universities and learn how CII Best Practices are implemented in a real world setting by large companies in the construction industry. Students taking the course get equipped with the practical knowledge that they can immediately implement once they start working in the construction industry. Another benefit that the students get by participating in this course is the opportunity for networking as discussed earlier. Furthermore, at the conclusion of this course, CII requests interested students to submit a resume and a letter expressing their interest in obtaining an internship with one of the CII member companies in an effort to place them in summer internships. It is also important to note that students get free access to CII’s resources (published research reports and online education modules) during the semester in which they are registered for this course. Normally, such resources are only available to CII member companies upon payment of their yearly dues. There were also a few concerns identified by the students as discussed in the previous section. All of these concerns have been communicated to CII so that they can be addressed in the next offering of this course. Authors believe that the long duration of the sessions can be alleviated by adding more in-class exercises and getting the students engaged more. The other two issues (choice of instructors and overlap between sessions) can easily be addressed by CII.

CII has proven that it is committed to educating the future talent of the construction industry by making the CII Best Practices course available to any interested university. As a course taught by industry leaders, it gives the students the confidence that what they are learning will be applicable when joining the industry. Given the benefits experienced by the authors’ university (both by the Instructor of Record and the students) by incorporating this course into its curriculum, it is highly recommended that other ASC member schools consider participating in the future offerings of this course, at least on an experimental basis. It is important to note that after this course was offered for two times (in 2009 and 2010) as an experimental course, it was decided to make it a permanent course at the authors’ university. ASC member schools which are interested to participate in the future offerings of this course can directly contact CII’s director whose contact information is provided at the URL below:



<https://www.construction-institute.org/scriptcontent/roster.cfm?section=aboutcii>

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