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CET 416-002: Senior Construction Project

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New Jersey Institute of Technology
School of Applied Engineering and Technology
Construction Engineering Technology and
Construction Management Technology Programs

COURSE MANUAL for
CET 416
SENIOR CONSTRUCTION PROJECT
SPRING 2020

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Table of Contents

Introduction

CET 416, Senior Construction Project, is the capstone course for Construction Engineering Technology (CET) and Construction Management Technology (CMT) programs here at NJIT. The prerequisite for this course is CET 415, Construction Project Management. This also presumes that the student has completed the bulk of the entire CET and CMT curricula and it is preferable that the student enroll in this course during his last semester in the program.

What is a Capstone Course and why is it required?

A capstone course experience is defined as

> *"Also called a capstone experience, culminating project, or senior exhibition, among many other terms, a **capstone project** is a multifaceted assignment that serves as a culminating academic and intellectual experience for students, typically during their final year of school, or at the end of an academic program. While similar in some ways to a college thesis, capstone projects may take a wide variety of forms, but most are long-term investigative projects that culminate in a final product, presentation, or performance.*
>
> *For example, students may be asked to select a topic, profession, or social problem that interests them, conduct research on the subject, maintain a portfolio of findings or results, create a final product demonstrating their learning acquisition or conclusions (a paper, short film, or multimedia presentation, for example), and give an oral presentation on the project to a panel of teachers, experts, and community members who collectively evaluate its quality.*
>
> *Capstone projects are generally designed to encourage students to think critically, solve challenging problems, and develop skills such as oral communication, public speaking, research skills, media literacy, teamwork, planning, self-sufficiency, or goal setting—i.e., skills that will help prepare them for college, modern careers, and adult life. In some cases, the projects are also interdisciplinary, in the sense that they require students to apply skills or investigate issues across many different subject areas or domains of knowledge. Capstone projects also tend to encourage students to connect their projects to community issues or problems, and to integrate outside-of-school learning experiences, including activities such interviews, scientific observations, or internships."*
>
> While capstone projects can take a wide variety of forms from school to school, a few examples will help to illustrate both the concept and the general educational intentions:
>
> Designing and building a product, computer program, app, or robot to address a specific need, such as assisting the disabled....
>
> Interning at a nonprofit organization to learn more about strategies and policies intended to address social problems, such as poverty, hunger, or homelessness...

> Conducting a scientific study over several months or a year to determine the ecological or environmental impact of changes to a local habitat...
>
> Researching an industry or market, and creating a viable business plan for a proposed company that is then "pitched" to a panel of local business leaders....
>
> Working at a construction company to introduce a new process, software or protocol that aids the company and the construction industry...

In our case, our capstone experience will be the preparation of proposals and related construction industry documents for a series projects much in the same way that you will do after you graduate as well as project management exercises based on actual projects. Each of these activities will address different aspects of the construction industry and will hopefully test the students' abilities in all of the areas of the curriculum.

The presentation of materials will be done in both written form as well being presented face to face with hard copy as well as in person. The in person presentations will be in the form of a charette, where the panel will consist of the various instructors in the program. The grade in the course will be a combination of the written materials, the presentation as well as the ability to effectively function as a team.

This is the opportunity for students to "put it all together" and demonstrate their knowledge and mastery of the materials and topics that were presented as part of the curriculum in as near a "real" situation as we can possibly do in an academic environment. Therefore, for some students it may be the best course they've ever taken and for others it will be one of the worst. It will be a lot or work, it will require you to work in a team environment and you will be graded on an industry standard.

One other aspect of capstone courses is that they are as much an evaluation of student ability as they are an evaluation of the overall performance of the faculty with respect to the delivery of the curriculum. For instance, if a particular aspect of a course was not effectively taught, it will be painfully obvious that the material was not presented effectively and revisions to the course materials and an adjustment of the teaching modalities must be made by the faculty. This is why the review panel is made up of your Instructors.

The Accreditation Board for Engineering and Technology (ABET) requires that all creditable programs [1] have a capstone experience as part of their curriculum. This requirement is found in Criterion 5, Curriculum, Criteria for Criteria for Accrediting Engineering Technology Programs, 2020 – 2021, and states

> *<u>The Integration of Content</u> Baccalaureate degree curricula must provide a capstone or integrating experience that develops student competencies in applying both technical*

[1] The CET program is accredited by ETAC of ABET and has been so since 1978. The CMT program is not accredited but this process is still valid for continuous improvement for the CMT program.

and non-technical skills in solving problems.

One final thought - capstone experiences are as much an evaluation of the student as it is of the Instructor, the program and the institution. We take this portion of the capstone experience extremely seriously as it forms the basis of our on-going assessment of our programs and the continuous improvement of the programs.

Accreditation

Accreditation is an important aspect to our program. First, it sets a standard for content and continuous improvement which is important for any program. These two aspects define the program. Providing a standard for content is important in that this is a standard that can be viewed as a national standard for what comprises the program. The aspect of continuous improvement sets a standard for review, assessment and improvement of the program on either a semester or annual basis. For a program to remain alive and relevant, it is necessary that it must continually evolve and evaluate its ability to meet its mission.

The other aspect of accreditation is that it creates a path for graduates of the CET program to obtain licensure as a professional engineer. [2] The New Jersey Board of Professional Engineers and Land Surveyors requires, as a minimum standard[3]

a. *Graduation from a board approved curriculum in engineering of four years or more; a specific record of an additional four years or more of experience in engineering work of a character satisfactory to the board, and indicating that the applicant is competent to be placed in responsible charge of such work; and successfully passing all parts of the written examination;*
b. ***Graduation from a board approved curriculum in engineering technology of four years or more; a specific record of an additional six years or more of experience in engineering work of a character satisfactory to the board, and indicating that the applicant is competent to be placed in responsible charge of such work; and successfully passing all parts of the written examination;***
c. *Graduation from a board approved curriculum in engineering or engineering technology of four years or more; a specific record of an additional 15 years or more of experience in engineering work of a character satisfactory to the board and indicating that the applicant is competent to be placed in responsible charge of such work; and successfully passing the specialized portion of the written examination which is designated as Part P;*

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[2] Not all states allow Engineering Technology graduates to gain licensure as a professional engineer, however, New Jersey, New York and Pennsylvania do. For a complete list of state by state requirements for licensure and the Fundamentals of Engineering examination, please consult the website of National Council of Examiners for Engineering and Surveying®, https://ncees.org/engineering/

[3] See N.J.S.A. 45:8-35. 1 - Applications for license, certificate of registration; fees; qualifications; evidence of qualifications; examination

Therefore, accreditation of the program and the continued renewal of accreditation is paramount to the success of the program.

The criteria describe Student Outcomes for the program. A Student Outcome is defined as

> *"Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program.[4]"*

With respect to the actual Student Outcomes and Technical Criteria that must be addressed in the program , the Student Outcomes can also be found in the Criterion 3, Student Outcomes, of the ABET criteria.[5] Specifically, the requirements are

> "B. For baccalaureate degree programs, these student outcomes must include, but are not limited to, the following:
>
> (1) an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;
>
> (2) an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
>
> (3) An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;
>
> (4) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
>
> (5) an ability to function effectively as a member as well as a leader on technical teams."

These standards apply to all undergraduate Engineering Technology programs.

In addition the above requirements, the program must also address the Program Criteria found in these standards.[6] Specifically,

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[4] See Criteria for Accrediting Engineering Technology Programs, 2020 – 2021, General Criteria, Criterion 3, Definitions, https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-technology-programs-2020-2021/

[5] See Criteria for Accrediting Engineering Technology Programs, 2020 – 2021, General Criteria, Criterion 3, Student Outcomes, https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-technology-programs-2020-2021/

[6] See Criteria for Accrediting Engineering Technology Programs, 2020 – 2021, Program Criteria, https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-technology-programs-2020-2021/

II. PROGRAM CRITERIA FOR BACCALAUREATE LEVEL PROGRAMS

Curriculum

Graduates of baccalaureate degree programs typically specify project methods and materials, perform cost estimates and analyses, and manage construction activities. The curriculum must provide instruction in the following curricular areas:

a. utilization of techniques that are appropriate to administer and evaluate construction contracts, documents, and codes;

b. estimation of costs, estimation of quantities, and evaluation of materials for construction projects;

c. utilization of measuring methods, hardware, and software that are appropriate for field, laboratory, and office processes related to construction;

d. application of fundamental computational methods and elementary analytical techniques in sub-disciplines related to construction engineering;

e. production and utilization of documents related to design, construction, and operations;

f. performance of economic analyses and cost estimates related to design, construction, and maintenance of systems associated with construction engineering;

g. selection of appropriate construction materials and practices;

h. application of appropriate principles of construction management, law, and ethics; and

i. performance of standard analysis and design in at least one sub-discipline related to construction engineering.

In order to address and assess the above criteria, a matrix was created to tabulate these criteria, and indicate in which of the courses these criteria will be covered and assessed. As a capstone course represents a summary of the course work within the program, the bulk of the program assessment is found there. Therefore, the bulk of the activities in this course will require the student to rely on all of the subject areas and outcomes that are within the program. This will be accomplished by direct [7] and indirect[8] assessment tools.

Course Format

[7] A direct assessment tool is one where the actual assessment tools is within the task or is a part of the assignment or task. As an example, a calculation that demonstrates a student's ability to apply or utilizes a process. This is an example of an indirect assessment tool. is an example of a direct assessment tool.

[8] An indirect assessment tool is one where the assessment tool the assessment is measured by implication. For example, the ability of a student team to function effectively can be indirectly measured by polling the participants of the group.

Lectures

The course has two central lecture sessions, one at the beginning of the semester and one at the end of the semester, for which attendance is required. The first of these sessions will present a course introduction and overview, the manner in which the course will function and establish the first team assignments. The last session will be a wrap up of the activities of the course.

Each week there will be a lecture that will address various issues, such as ethics, professional issues, project review and project questions. Dates of the lectures and dates of the presentations are indicated on the course schedule shown at the end of this document. For the day section (Section 002), the lecture will occupy the first session of the week, while the second lecture of the week will allow for each of the student teams to present a status report for the progress of their work as well as time for team meetings, if sufficient time remains. For the Saturday section (Section 102), this same process will take place with the lecture occupying approximately the first 1.5 hours and remainder of the time being engaged in status reports and teams meetings. In any event, your instructor will be in attendance each week to answer questions, provide insights to the groups and monitor group progress. [9]

Team Assignments

At the beginning of the course and at the beginning of each project, teams will be formed by random assignment by the Instructor[10]. Ideally, as the class is a mix of CET and CMT majors, there will be an even number of persons assigned to each group and, as CET majors outnumber the CMT majors, ideally each group will have one CMT major.

The reason for the mix is that the 2 curricula differ with respect to technical skills and management skills. Therefore, CET students should be assigned to the portions of the projects that are more technical in nature, such as the design of formwork and beam or slab design, whereas the CMT students should address the more management and financial aspects of each project such as project financing and cash flow.

In the overall creation of the teams for the course, the intent is to have all students be in various groups with each student in the class so that they have the opportunity to work with everyone. This may not be achieved but it is the goal for group formation.

This being done for several reasons. In this industry, there is the practice of rapidly assembling and disassembling teams to accomplish a project or an aspect of a project. To work effectively, one must develop the skill of being able to work with a new and diverse group (and the accompanying personalities) in a rapid manner and produce a project. For all projects, all students will evaluate their, as well as their teammate's performance on the project. These will be confidential evaluations between the student and the Instructor and will be supplied electronically via Canvas. These will be required submissions for all students and are required as part of each project's "close out".

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[9] This can include settling group disputes.

[10] The exception to this is the final project where you will be give the opportunity to form your own teams.

For the final project of the semester, and within a limited time frame, the students will be permitted to form their own groups with the only restriction being that the groups still be diverse with respect to CET and CMT majors, if possible. In the event that students fail to supply team lists in accordance with the time line, they will assigned by the Instructor, on a "first come" basis.

Project Submissions

Written Submissions

For each project, both digital and hard copies may be required and that will be indicated in the project statement for each project. The digital copies will always be required for each project and must be posted by 8:00 P.M. of the day before the scheduled due date for the project by one member of the group. The hard copy, if required, is due on the date of the presentation. Any materials submitted after the 8:00 P.M. deadline will not be available for use by the group during their presentation and will be considered late.

The formats of the submittals are as follows:

Digital Submissions

The digital submissions should be transmitted in a file(s) that are named as follows:

Course Number and Semester

Project Number

Group Number

As an example, the submission of Project No. 1 for this semester of Group 3 in the Saturday section would be named

"416S20 102-P1-G3"

Any other identifying information, such as estimate, power point, etc. can be added after the above information.

As an example, the submission of Project No. 1 for this semester of Group 3 would be named

"416S20 102 -P1-G3 – PowerPoint" or "416S18-P1-G3 – PPT"

Also, all references should be done by Group Number as that is the only way submissions can be tracked. **The creation and use of team names is discouraged.** [11]

It is recommended that all groups do their work in Google Docs and include the Instructor as part of the group so that project activity may be monitored during the preparation of the project work.

[11] Save the creation of team names for your marketing class.

Hard Copy Submissions

The hard copy should be submitted as a bound document, such as a 3 ring binder or some other acceptable form of binding. However, the size of the materials should be 8 ½ x 11 inches is preferred, as long as the material is legible. Any materials that are larger than that format should be properly folded and inserted in the binder. The cover of the binder should indentify the Course Name, Project Number, Group Number and the participants of the Group.

It should be noted that the materials that are being presented should be presented in as professional a manner as possible.

As an example, the cover sheet should resemble the following:

CET 416

Section 002

Senior Construction Project

Spring 2020

Project 2

Construction of the Brooklyn Bridge

Group 4

Group 4 Members:

Joe Goodstudent

Bill Average

Jimmy Slacker

Submission Contents

The submission of the project should include the following documents:

Cover page [12]

Letter of Transmittal & Proposal page [13]

Table of Contents [14]

Executive Summary

Assignment of Project Tasks

Constructability Analysis

Logistics Plan/Strategic Construction Plan

Project Financing

Risk Analysis

Safety

Detailed Cost Estimate

Schedule

Project Financing

Appendices:

Calculations

Submissions

Team Meeting Minutes

Catalog Cuts and Shop Drawings

Miscellaneous Documents

Power Point Presentation Slides

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[12] Shown Above

[13] This will be presented to the student during the project assignment and should be signed by all members of the team prior to submission.

[14] The Table of Contents should include the items/areas shown below.

A description of each of these areas follows.

Executive Summary/Letter of Transmittal

An Executive Summary should be a maximum of 1 page giving an overview of the project and your solution to the specific problems presented by the project and your solutions to address them. This should include the projection of profit (or loss) and any constraints, such as delay, weather, etc., that would impact the success of the project.

Assignment of Project Tasks

In this section you will list the various tasks that need to be completed for the project and to whom they are assigned. It would be helpful that each group designate a team leader/contact person and the Instructor be advised of whom that person is as soon as possible after the assignment of the project. As an example:

Team Leader : Charlie Harper
Responsibilities: Running team meeting, writing meeting minutes, submission of documents, checking all documents

Design Calculations: Walden Schmidt
Responsibilities: Design calculations of beam, quantity of fill, checking estimate calculations

Schedule: Lyndsey MacElroy
Responsibilities: Preparation of project schedule, proof reading team minutes

Estimate: Teddy Leopold
Responsibilities: Preparation of project estimate, checking of design calculations, checking of schedule

A portion of your individual grade will be based on your ability to complete the tasks assigned to you and the correctness of your solution.

Constructability Analysis and Risk Analysis

The Constructability Analysis portion of the proposal will be divided into three sections, Project Strategy, Logistics Plan/Strategic Construction Plan, Project Financing and Risk Analysis.

In the Logistics Plan/Strategic Construction Plan, you are requested to devise a plan on how you intend to construct the project. This should include, but not be limited to, where materials will be stored, where the construction trailer will be placed, site ingress and egress for materials, equipment, and employees, location of equipment, installation of utilities, phasing of site construction, and any other related site and construction issues.

The project strategy should be presented as a flow chart to indicate how the elements of the project will be constructed. This should shadow your CPM. The flow chart can be created or presented in MS Word,

Project or Visio or similar software. Please be aware that the digital copies of all submissions must be readable on an IBM PC.[15]

With respect to Project Financing, you will need to address the cost of the project in order for you to complete the project financially successfully. This should include a look at your profit margins, project overhead, cash flow analysis and borrowing analysis to complete the project without losing money on the project. Cost and productivity of labor and equipment need to be presented using current equipment and labor rates. You may assume that the work on the project will be union labor.

After completion of the two above tasks, a Risk Analysis should be prepared as to what factors will determine the success or failure of the project, i.e., how many days can be tolerated for weather delays, what are the minimal acceptable production rates, what other factors may influence the success of the project, etc. and whether or not the project will succeed financially. As all groups will be preparing a similar analysis, it is important to be accurate and realistic in your analysis.

Safety

In reviewing the project and the various construction techniques that will be required, identify the various aspects of construction safety for the project that will need to be monitored and a solution or solutions on how they be addressed and monitored. This can be done with an explanation of construction technique as well as catalog cuts for the safety equipment that will be employed during the project. Also, if a particular safety aspect affects labor productivity, it should be noted in your analysis.

Detailed Cost Estimate

In this section, the detailed cost estimate should be inserted. This should include the calculations as well as the summary sheets for each of the items of work for the project. Costs for labor should be based on the current New Jersey prevailing wage rates[16]. Production rates should also be stated. It is advisable to include a written summary of the estimate as a cover sheet to this section. Also, a summary sheet of manpower and an equipment list that will be on the site by week should be included. A summary equipment list of what equipment will be on the project should be included.

An example of the format of calculations is found in Appendix A.

Schedule

A Gantt or a CPM schedule should be prepared in Microsoft Project. That schedule should reflect the costs, manpower and production rates as determined in the Detailed Cost Estimate. Consideration should be given in the schedule to balancing of resources. The printed schedule should be no larger than 11" x 17"[17] and must fit on the sheet.

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[15] If you are using an Apple of Macintosh laptop, you may avoid this problem by saving your documents as a pdf or gif file.

[16] Current prevailing wage rates can be found at http://lwd.dol.state.nj.us/labor/wagehour/wagerate/prevailing_wage_determinations.html

[17] If you are using anything larger than 8 ½ by 11, please fold the paper correctly. If you do not know how to fold the paper correctly, please ask your instructor.

Project Financing

In this section, a more detailed estimate as to cash flow, both positive and negative, should be presented. This should include any interim short term loans needed to finance the project, the weekly payroll, and monthly costs for materials, equipment and payments to subcontractors (accounts payable) as well accounts receivable from the owner for the project.

Appendix 1 - Calculations

This section should include the design calculations of any and all aspects of the project. This can include formwork calculations, excavation quantities, lifting calculations for steel erection, etc. Calculations should be presented either as an excel spreadsheet or, in the case of hand calculations, presented on quad paper. If the calculations are to be done by hand, the writing should be legible, formulas referenced and the complete calculation shown. **Calculations do not need to be typed but should legibly hand lettered**. All pages should be prepared in the correct orientation. Page size of 8-1/2 by 11 are preferred if legible.

An example of the format of calculations is found in Appendix A.

Appendix 2 - Submittals

In this section please feel free to include the Catalog Cuts, shop drawings and other miscellaneous items (such as concrete design mix, asphalt design mix, gradation curves of granular fill, etc.) that are to be used in the construction of the project.

Power Point Presentation Slides

The PowerPoint slides, if required, should be printed an included in this section. The presentation should not be printed in color, but in pure back in white as handouts, no more than 3 per page. In this instance, content is more important that color.

Submittals

As part of your project submission, a series of submittals are required. Not all projects will require all submittals so your judgment is required in determining what should or should not be submitted.

Team Meeting Minutes

For each team for each project, minutes of all team meetings are required.

Minutes of team meetings should be taken and submitted electronically each week of the project. These should be submitted by Sunday midnight for each week that you are engaged in a project. The minutes, at a minimum, should indicate the following information:

Date of Meeting	Start time of Meeting
Location of Meeting	Ending Time of Meeting

Team members in attendance

Matters discussed (i.e., project team member assignments, issues, problems, matters to be Researched, etc.)

Catalog Cuts and Shop Drawings

If needed for the project, Catalog Cuts or Shop Drawings should be supplied to demonstrate compliance with items of work for the project. Catalog cuts may be downloaded from manufacturer's websites whereas shop drawings may be produced by the students in a CAD drawing.

Miscellaneous Documents

Certain projects require miscellaneous documents in order to flesh out the project submissions. These are not required in all situations but depend on the project. An example of this could be a steel erection plan which would be required for the erection of a building with a steel frame. If you were doing a project that requires trades people to work above or below a safe working height, a safety plan might be required to demonstrate how the project will be constructed safely. If you were working on a project that requires the detour of traffic, a Maintenance and Protection of Traffic[18] that is compliant with the Manual on Uniform Traffic Control Devices (MUTCD) would be required.

Presentations

If required, each group will make an oral presentation of their project on the assigned dates and times. The presentations will be given in the room assigned to the course and all class members are expected to attend each presentation and arrive on time. Each presentation will be no longer than 15 minutes and all group members are expected to contribute equally to the presentation. Presentations need to be forwarded by 8:00 P.M. of the evening prior to the due date so that they may be preloaded into the Instructor's laptop prior to making any presentations. This will speed up the process. Any presentation not received by that time will not be eligible for use during the presentations.

The schedule for the presentations will be randomly assigned by group number. The presentation will be in a charette format, where the presentation may be made by each individual group and presented to a panel of judges. No one but the judges and the presenting group will be allowed in the room during each presentation. Once each group is done with their presentation, they are dismissed for the day.

Dress for the presentation will be business casual. By this it is meant that, for the men, nice jeans, khakis, a collared shirt or a polo if the weather is warm enough, are acceptable. For the women, similar

[18] known as an MPT Plan

attire is expected. The key here is to present you in a neat, businesslike manner. You need not wear a suit nor do you need to have matching outfits.

While the hard copy of your slides may be in black and white, your slide show should emphasize your ability to be creative and professional in your presentation. There may be presentations that will require you to expand your horizons in presentation with such things as animation.

Please be aware that the panel of judges will have the right to interpret your presentation, ask questions and generally interrupt your presentation to ask questions. No extension of time will be granted as we will stick to our time schedule.

Grading of the Course

Your grade in the course will be a function of many parameters. Your group will be graded on their written performance based on the rubric for each project as well as the group's presentation. The presentation should mirror the materials contained in the written submission and should address all of the aspects of the written submission. As each project is different, a different rubric for each project will be distributed as part of the course materials. In addition to your group grade, there will be an evaluation done of the work that you performed as part of the group activities so that you will be receiving an individual grade as well.

Finally, each group member will be asked to honestly assess the performance of all members of the group. That evaluation will be done after each presentation and will be a private document between the instructor and the student making the evaluation and your ability to function as a team member, i.e., ability to complete assigned tasks on time, ability to lead, follow or get out of the way, quality of your work, etc., will also be counted in your overall grade for the course.

Your grade in the course will therefore be a function of all of the above items.

Leadership and Team Function

We start with the basic assumption that all team members will be giving their full effort to complete the assigned project. You will find that the assigned projects are of fairly large, complicated scope and need to be completed in a relatively short time frame. This is typical of our industry.

During the course of this semester, you will be paired with various members of the class with which you will have to quickly establish a working relationship in order to complete the project assignment. The projects are intentionally not small in nature and you need to be mindful of that fact. Further, these are real projects and you will be held to a professional standard in your presentations and submissions.

It is necessary to establish a team structure a quickly as possible and commit to completing your aspect of the project as well as assist those who are struggling with their portion. In order to be successful, everyone must participate otherwise your team will either not complete your task or your presentation

will be sub-par. This is the way the construction industry operates, quick assembly and disassembly of project teams, to complete an assigned task within a specified time frame.

It would be unrealistic to assume that all groups will function harmoniously. This is also like reality. However, in the case of this course you will only be assigned to this particular group for 3-4 weeks.

You do not have like all the members of your team but you do have to tolerate each other enough and get the project done. If you do make friendships along the way, so much the better but the bottom line is that you have to perform as a team.

In the past, I have seen groups basically implode, which was not good for anyone. You cannot let this happen. If someone is not doing their share, you may email your instructor or include him in your email loop to your team members.

One final piece of advice is that you must communicate. That is one of the most important lessons to be learned from this course. Most team failures are a function of a lack of communication and this is also an experience from real life. When people fail to communicate, that's when the problems arise.

You must work diligently to prevent this.

Finally, at the end of each project you have the opportunity[19] to rate the performance of you and your team members. This offers several opportunities –

1. You can vent about your team members[20]
2. You are forced to review your own performance by self reflection[21]
3. You can learn what went wrong and what you can do better with the next project.

Final Assessment Test and Exit Survey

A Final Assessment Test will be administered during the Final Exam week. [22] The Final Assessment Test is a 100 question, multiple choice examination that covers all of the subject matter that is a part of your curriculum. There are two different tests, one for CET and one for CMT. The test is a direct assessment instrument for each of the programs. This is a benchmarking test that has been administered over many years and it used to gauge the progress the program has made in each individual year. The test is a function of how much information you have retained and how we have delivered it. Your grade on the test is immaterial and you will receive full credit for completing the test. You do not need (and cannot) study for the test. <u>All that is required is to bring a pencil or pencils and an eraser. Pencils will not be supplied at the test.</u>

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[19] Actually this is an assignment and it is required.
[20] They will also be venting about you.
[21] Honest Self reflection is always a good exercise. It is a good way to grow personally and professionally.
[22] For Section 102 this will occur n May 9, 2020; For Section 002, this date will be announced with the publication of the Final Exam Schedule.

The Exit Survey will be distributed during the final week of the semester and the student needs to print this questionnaire, complete it and bring it to the Final Assessment Test. You may answer the questionnaire honestly with no fear of reprisal.

Your grade on the test is immaterial and you will receive full credit for completing the test and submitting the questionnaire

Course Schedule

Our tentative schedule for this semester is found in a separate document and is posted in Canvas.

Note: In the event of inclement weather, presentations may be cancelled but proposals are still due by the Friday 8:00 P.M. deadline.

Grading Rubric

The grading of the project is a fairly complex matter in that your grade will be a function of your team's performance as well as your own performance on each project.

A grading rubric will be provided as part of each project assignment. Please be guided by the rubric for each project. All projects will be of the same value.

Course Grading

The grade in the course will be based on the following:

Projects	70%
Final Assessment Test	5%
Assessment Questionnaire	5%
Attendance	5%
Other Assignments & Quizzes	15%
Total	100%

Course Ethics

As with all materials submitted credit, it is expected all materials submitted are the original work of the persons submitting it and that any materials obtained from another source are properly documented. This is embodied in the University Policy on Academic Integrity. A statement of compliance with this policy should be made part of each project's submission and signed by all members of the team. Violations of the policy will be referred to the Dean of Students for investigation and possible discipline.

A copy of the NJIT University Policy on Academic Integrity is shown in Appendix E.

It would be very unfortunate to end an academic career on a violation of this policy.

Index to Appendices

Appendix A

How to Perform and Submit Calculations

Calculations are the lifeblood of decision making. While they may be the original creation of a single author, they need to be presented in a clear, concise manner that should be reviewed and approved by someone (or "someones") other than the original author of the calculation.

Many good engineering and contracting companies have standard templates for preparing a design calculation report which help in saving time and are helpful to new employees. Certain engineering calculation reports are prepared on the basis of the format prepared and provided by certification authorities such as building departments, the Soil Conservation service, NJDEP or NJDOT and these are absolutely required prior to the official action of an agency. However, if you do not have any standard format for an engineering calculation report you don't need to worry. Just follow the following general guidelines for doing calculations so a reviewer can follow how you arrived at your solution and you should be fine.

Calculations should be done on calculation paper, which is 8-1/2" by 11" and quad-ruled. The pages should be individual sheets of paper and not ripped out of a note book. The pages should be numbered, and dated. The name project and of the author of the calculation should appear as well as the initials of the person or persons reviewing or checking the calculation. No calculations should be submitted without being checked. The calculations do not need to be typed but should be **legibly printed**.

A sample calculation sheet is attached.

Objective of Calculation

The first item in the calculation would be the objective of the calculation. For example, Sizing of a Beam. Briefly mention what you are trying to achieve, for example if you are trying to size a beam, mention the

calculation objectives such as dead loads, live loads, etc.

Reference Materials

You must then provide the references for the input data for the calculations. For example this could be the particular code you are designing from, i.e. AISC Steel Design Manual, 15th edition, 2017. Do not forget to provide the table or chart you are employing in the calculation. You may wish to include a pdf of the table or chart and attach it to the calculation. You may need to include several references.

Assumptions

All assumptions need to be listed separately. Since assumptions lead to a certain degree of uncertainty in the calculations, a reasonable amount of caution needs to be exercised when stating your assumptions. Assumptions should be based on sound logic and past experience for similar calculations leading to a successful design. The focus should be to minimize the assumptions.

Calculations

It is always good practice to write the original equations, without numerical values used for the calculations in this part of the design calculation report instead of just providing a reference to the original equations. Reviewers will feel more comfortable about seeing the design equations in the actual document then trying to look for them at some other place. The calculations should be done step-by-step following a logical progression. The reviewer of your document will feel lost if the calculations do not follow a logical progression.

Also, equations should be stated with the variable names and the equations manipulated so that all unknowns are on the left hand side of the equation before any numbers are introduced to replace the variables and the equations solved. This seems like a lot of extra work however it is the best way to check calculations and detect basic math mistakes.

Conclusion / Summary

This section of the design calculation summarizes the result of the calculations. For example, in calculating a beam size, the selected beam size should be underlined or otherwise highlighted.

Attachments

This optional section will include the actual copies of the references provided in the input section. These may include parts or copies of the relevant portions of plans, E-mail correspondence copies, relevant pages of engineering textbooks, relevant pages of national design standards, etc., which will explain how the solution was achieved.

Checking Calculations

All calculations need to be checked. This is the one area that seems to have fallen on hard times lately. After all, if I did the calculation on a computer, how can it be wrong, software doesn't make mistakes.

That is true, sort of.

If you enter data into a software program, the solutions that are generated will be calculated correctly. However, software just grinds out the numbers without respect to your reasoning on how the calculation was performed. I once had a student design a concrete cantilever beam that was 2 inches thick and cantilevered for a distance of 25 feet. I told him that would not work nit he argued with me that if he can draw it in AutoCAD, it must be okay.

Therefore, all calculations need to be checked for several things:

1. Correctness of the logic of the calculation
2. Correctness of the mathematical manipulation
3. Correctness of the data inputted
4. Correctness of the grinding of the numbers

By the way, it is perfectly acceptable to have a discussion on how a calculation strategy is to be performed. You will learn more in a discussion with a team mate over a calculation the you will sitting a lecture hall. [23]

[23] That all depends on the instructor.

CET 416
Senior Construction Project
Calculations Sheet

Project No. : 2 Team No. 3

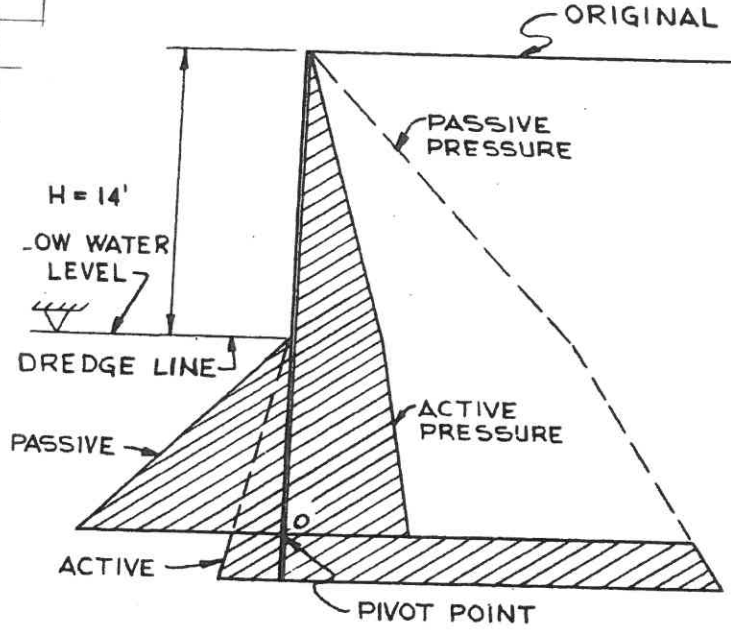
Title of Calculation: Design of Sheet Pile Wall

Prepared by: JAW Date: 1/10/20

Checked by: EAG Date: 1/15/20

TASK: DESIGN OF CANTILEVERED SHEET PILE WALL - GRANULAR SOIL

RESULTANT PRESSURE DISTRIBUTION



GIVENS:

MEDIUM SAND

$\gamma = 115$ PCF

$\gamma' = 65$ PCF

$\phi = 35°$

$\gamma/\phi = -0.5$

$K_a = 0.27$ } SEE FIG. 5A

$K_p = 6.56$ }

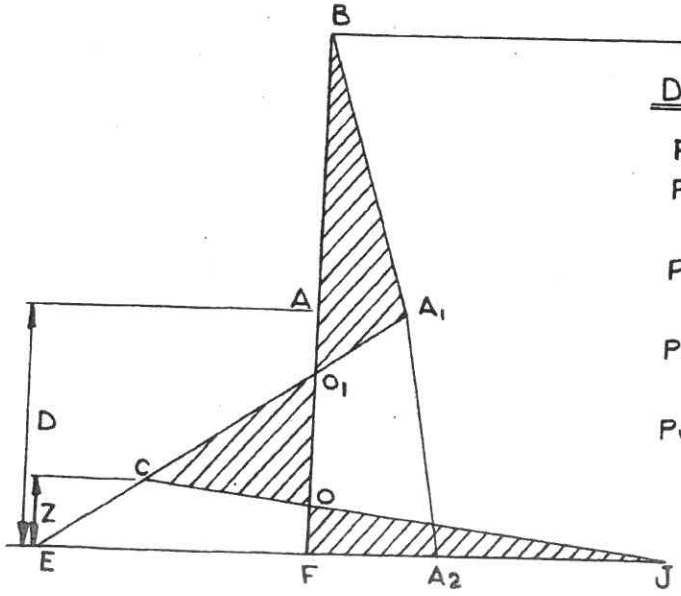
APPLY SAFETY FACTOR AT END ✓

$K_p - K_a = 6.29$

γ_e = EFFECTIVE UNIT WEIGHT

NOTE: FIG 5A is FROM USS SHEET PILING MANUAL

CONVENTIONAL ASSUMED PRESSURE DIAGRAM



DETERMINE WALL PRESSURES

$P_{A_1} = \gamma_e H K_a = (115)(14.0)(0.27) = 435$ PSF

$P_{A_2} = P_{A_1} + \gamma_e D K_a = 435 + (65)(0.27) D$

$= 435 + 17.6 D$

$P_E = \gamma_e D(K_p - K_a) - P_{A_1} = 65D(6.29) - 435$

$= 408.9D - 435$

$P_J = \gamma_e D(K_p - K_a) + \gamma_e H K_p = 65D(6.29) + 115(14)(6.56)$

$P_J = 408.9D + 10,562$ ✓

CET 416
Senior Construction Project
Calculations Sheet

Project No. : 2 Team No. 3

Title of Calculation: Design of Sheet Pile Wall

Prepared by: JAW Date: 1/10/20

Checked by: EAG Date: 1/15/20

FROM STATICS, THE FOLLOWING CONDITIONS MUST BE SATISFIED

(1) $\Sigma F_H = 0$ IN TERMS OF AREAS:

AREA (BAA_1) + AREA (AA_1A_2F) + AREA (ECJ) − AREA $(EA_1A_2) = 0$

OR

$$\frac{1}{2}(H)P_{A_1} + (P_{A_1} + P_{A_2})\frac{D}{2} + (P_E + P_J)\frac{Z}{2} - (P_E + P_{A_2})\frac{D}{2} = 0$$

SOLVING FOR Z:

$$Z = \frac{(P_E - P_{A_1})D - H P_{A_1}}{P_E + P_J}$$

(2) ΣM ABOUT ANY POINT IS ZERO

$$\Sigma M_F = \frac{1}{2}(H)P_{A_1}\left(D + \frac{H}{3}\right) + (P_{A_1})\frac{D^2}{2} + (P_E + P_J)\frac{Z^2}{6} - (P_E + P_{A_2})\frac{D^2}{6} + (P_{A_2} - P_{A_1})\frac{D^2}{6} = 0$$

METHOD OF SOLUTION:

1. ASSUME A DEPTH OF PENETRATION, D
2. CALCULATE Z
3. SUBSTITUTE Z INTO ΣM_F AND CHECK IF ZERO. ADJUST D AND RECALCULATE IF NECESSARY.

TRY D = 10.5 FT.

$P_{A_1} = 435$ PSF $P_{A_2} = 620$ PSF. $P_J = 14,855$ PSF $P_E = 3858$ PSF

$$Z = \frac{(3858 - 435)(10.5) - (14.)(435)}{14,855 + 3858} = \frac{29852}{18713} = 1.60 \text{ FT.}$$

$$\Sigma M_F = \frac{1}{2}(14.)(435)(10.5 + 4.67) + (435)\frac{(10.5)^2}{2} + (620 - 435)\frac{(10.5)^2}{6}$$

$$+ (3858 + 14,855)\frac{(1.60)^2}{6} - (3858 + 620)\frac{(10.5)^2}{6}$$

$$\Sigma M_F = 46,193 + 23,979 + 3399 + 7984 - 82,283$$

$\Sigma M_F = -728$ FT.-LB SAY O.K. USE D = 10.5 FT.

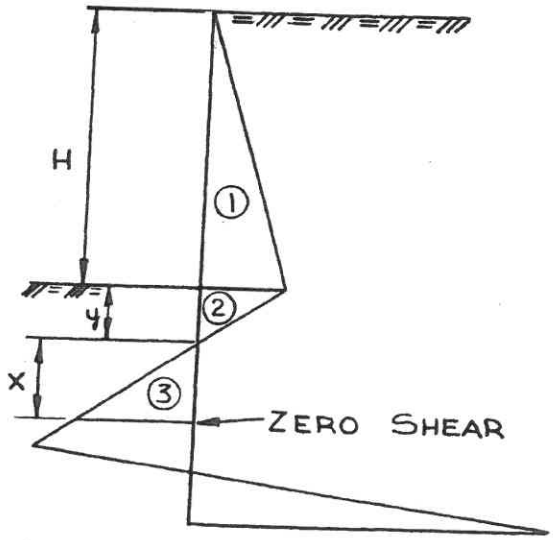
Project No. : 2 Team No. 3
Title of Calculation: Design of Sheet Pile Wall
Prepared by: JAW Date: 1/10/20
Checked by: BAG Date: 1/15/20

TO ASSURE A MARGIN OF SAFETY, D MAY BE INCREASED BY 20 TO 40 % OR, ALTERNATELY, A REDUCED PASSIVE EARTH PRESSURE COEFFICIENT COULD BE USED.

USE D = 13.5 FT. (INCREASE = 28.5 %)

MAXIMUM MOMENT AND SHEET PILE SIZE

LOCATE POINT OF ZERO SHEAR



$$y = \frac{P_{A1}}{\gamma'(K_P - K_a)} = \frac{435}{65(6.29)} = 1.06 \text{ FT.} \checkmark$$

SAY 1.0 FT.

$P_1 = \frac{1}{2} P_{A1} H = \frac{1}{2}(435)(14) = 3040$ LB ✓

$P_2 = \frac{1}{2} P_{A1} y = \frac{1}{2}(435)(1.0) = 218$ LB. ✓

$$\frac{1}{2}\gamma'(K_P - K_a) X^2 = P_1 + P_2$$

$$X^2 = \frac{2(P_1 + P_2)}{\gamma'(K_P - K_a)} \checkmark$$

Project No. : 2 Team No. 3
Title of Calculation: Design of Sheet Pile Wall
Prepared by: JAW Date: 1/10/20
Checked by: BAG Date: 1/15/20

$$X2 = \frac{2(3040+218)}{65(6.29)} = \frac{2(3258)}{407} = 16 \checkmark$$

X = 4.0 FEET

MAXIMUM MOMENT

$$P_3 = \tfrac{1}{2}\,\gamma'(K_P - K_a)\,4^2 = P_1 + P_2 = 3280 \text{ LB.}$$

$$M_{MAX} = P_1 \ell_1 + P_2 \ell_2 - P_3 \ell_3$$

$$M_{MAX} = 3040\left(\tfrac{14}{3} + 1.0 + 4.0\right) + 218\left(\tfrac{2(1)}{3} + 4.0\right) - 3280\left(\tfrac{4.0}{3}\right) \checkmark$$

$\ell_1 = \left(\frac{H}{3} + y + X\right)$

$\ell_2 = \left(\frac{2y}{3} + X\right)$

$\ell_3 = \frac{X}{3}$

$M_{MAX} = 29{,}300 + 1030 - 4360 = 26{,}000$ FT. LBS.

TRY REGULAR CARBON GRADE; $f_s = 25$ KSI

REQUIRED SECTION MODULUS $= \frac{M}{f_s} = \frac{26000 \times 12}{25000} = 12.5 \text{ IN}^3$

MUST USE PZ-27 - TRY EXTEN 45 STEEL; $f_s = 29$ KSI

REQ'D. $S = \frac{26{,}000 \times 12}{29{,}000} = 10.76 \text{ IN}^3$ USE PDA-27 $S = 10.7 \text{ IN}^3$ (ALTERNATE SECTION) ✓

CHECK USING FIG. 18 (DESIGN CURVE)

$K_P/K_a = \frac{6.56}{0.27} = 24.2$ $\alpha = \frac{14.0}{14.0} = 1.0$ ✓

FROM CURVES $\frac{D}{H} = 0.8$ ✓ $\frac{M_{MAX}}{\gamma' K_a H^3} = 0.65$

CET 416
Senior Construction Project
Calculations Sheet

Project No. : _____ Team No. _____

Title of Calculation: _____

Prepared by: _____ Date: _____

Checked by: _____ Date: _____

Appendix B - Googling for Good or Evil

Doing research and learning have certainly changed over the years and the rise of the internet has certainly enabled that. Aside from its many benefits, there are some interesting, and not necessarily good side effects that have come from this shift in information technology.

On the plus side, there is greater access to information. This is both in terms breadth of accessible knowledge as well as speed of accessibility. It used to be you either had to inherently know a fact or you had to go to a hard copy of a book or document to look up that information. [24] Having said that, when was the last time you went to library? Now, you can Google a word or a topic and within a few seconds you have your answer.

Or do you?

A few years ago in this course, a concrete mix design was required for the design of a concrete slab. In sitting through the presentations with a couple of my fellow instructors, one of which taught the concrete design course, we noticed that of the 8 presentations that were given, 5 of them were exactly the same[25]. And they were all wrong.

My concrete design instructor was flabbergasted. He thought there were cheating and they had all copied the wrong answer. I calmed him down by googling the basic design criteria, 5000 pound concrete, 3 inch slump, and coming up with the exact design that the 5 groups had submitted. It was the first hit I got when I googled that information.

Wrong, but there it was.

So what's my point?

The students were able to create a solution, albeit a wrong one, by googling and coming up with an answer. They did not have to consult a table or do any calculations and were able to quickly supply a solution. While I have no basic objection to what the students did, it was still wrong. They should have, at a minimum, checked the answer but they didn't. They were willing to use whatever they came up with on the Internet without regard to the correctness of the solution. They googled for evil, not for good.

My point here is that I do not have an objection to using the internet to find information as it is quick and easy. That's a good thing. The problem is that using information, without checking out the truth and validity of the information is just plain wrong and lazy.

I often use the internet as a starting point for my own investigation of a topic. But it is not the end of the search, only the beginning. If it is a technical solution I want to see what the sources of the information

---

[24] Like going to a library or asking someone for a copy of a book.

[25] Of the other 3 groups, I gave an acceptable answer and the other groups failed to include a design mix. It was rather abysmal

are and I want to manually run through the calculations based on what I know, what I've learned and, ultimately on my own judgment[26] as to whether this is an acceptable solution. You will learn over time that this last criterion – does it make any sense? - is actually the most important criteria in deciding whether or not to implement a solution.

In fact, you should probably never accept any solution without doing some check of the truth and validity of any information. For pure data, such as when an event occurred (or didn't), I will always check multiple sources. For technical information I want to look at the sources from which the information is derived and understand the context of the solution. As you are aware, the internet does not respect national barriers so that if you ask for a concrete mix design, you could actually be getting a design based on a different set of design criteria such as a British course or a source from another country based on their design practices. While these solutions may be fine and correct based on the design criteria of the code they are referencing, they may not be being done to the basic design parameters what are employed here and would then incorrect based on the context of the design.

[26] The ability to employ judgment is something that comes over time and is taught by that venerable instructor, experience.

Appendix C – Modern Citation Formats

The first thing to consider is that using reference materials is a good thing as it shows that you have made an effort to perform some sort of research on a topic or problem; however, there is huge caveat that comes with that statement. Any material that has not been created or discovered solely by you needs to be credited to the source from which you discovered the material. Also, there are specific guidelines for the citing of this information.

The ability to do research has certainly been made much easier by the Internet. Accompanying that statement is that it is much easier to steal a quote or material than ever before, by cutting and pasting. However, by using these same tools, it also much easier to discover when this occurs.

The basic tenet that you need to observe is that when you use reference material in any form, you must cite it to avoid plagiarism. If you are uncertain how to cite a source, the underlying goal should be that you display enough information so that if someone were to look for your source material they could easily find it.

There are several standard format for the citation of materials. Two of the most common are discussed below and are acceptable.

MLA Format

The "bible" for the Modern Library Association (MLA) format for citations is the MLA Handbook, 8th edition (2016) is the most current version of this handbook and is readily available. If you are going to be doing a good deal of writing, this book should be in your library.

While older editions are available as used versions, they differ from the more current editions in terms of how they treat the citation of on-line sources. This is an area that continues to evolve.

A convenient on-line reference can be found at http://www.easybib.com/guides/citation-guides/mla-format/

APA Format

Another popular format for citations is that pf the American Psychological Association (APA). This format comes to us from the social sciences but is often used for technical papers as well. Overall, it is similar to MLA but has its own idiosyncrasies.

A convenient on-line reference can be found at
https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/general_format.html

Appendix D – Power Point Presentations

How I want it done

The preparation of a PowerPoint presentation can be done in many ways and all are, more or less, correct. Even at this early stage of your career, you have probably made dozens of PowerPoint presentations. The correctness of the presentation is not the core issue. Rather the effectiveness of the presentation is the real issue, i.e., did you deliver all that was asked, did you do it in a manner that was effective and, lastly, did you hold the viewer's interest.

What is presented here is what is expected in this course and will be the basis of who you will graded in this course in this area. What is done and expected in other courses is fine for those courses but this is about this course.

One simple rule is that you need to follow is to keep it simple.

No one is ultimately impressed by your mastery of the software – they are there for the information that you have for them. If they are impressed with your technical ability to manipulate the software, you are in the wrong business and should open up a software company. Go create (and sell) an app – I understand there's money in that.

Did I get it all?

One of the problems with making a presentation (and preparing a complete report) is the fact that sometimes students don't get it all. By that I mean that they miss some of the more cogent points that the Instructor, and ultimately the client, were looking for. Therefore, how do we guarantee that we get it all?

A suggestion that I can make is that each member of the group should independently read the project statement and make a list of what is being asked for and then comparing the lists. Several pairs of eyes should be able to discover all the items that are needed.

Once you have agreed on the list, assign the tasks to the various team members and then make a checklist of where these materials will be presented. A sample work chart would look like this:

Task	***Assigned to***	***Place in Report***	***Place in Presentation***
Design of beam	Joe	Page 6 – calculations in Appendix A	Slide 5 - Overview of Design
Schedule	Tim	Page 3- Backup data in Appendix C	Slide 10- Revised to fit on slide
Budget	Bill	Page 10 - Backup data in Appendix D	Slide 2 – Revised to fit on slide

Hopefully by making the chart, you can resolve to get everything covered and all team members know their responsibility. Also, you now have a checklist of what needs to be competed and what is complete.

The only other column I would suggest that you add to the table is an expectation of when each item will be completed.

Slides and Slide Content

In giving a presentation, the attention of the audience should always be on the speaker, not on the slide. Your task is to get their attention and to hold it. If you lose the audience's attention, your presentation is not going to go well. You must make a concerted effort to get and hold the audience's attention.

In looking at presentations and slides over the years, there is always a temptation to place too much information on the slides. This has several negative effects:

1. Having a lot of information to read takes the audience's attention away from the speaker to the slide, which you do not want to do. Once their viewer's attention is off the speaker, you've lost them.
2. People read slower than you talk. If there is a lot of text, they will be reading your text long after you have covered the information on the slide.
3. Having a lot of text or data on a slide makes the slide difficult to read. The same rule applies to figures or tables that contain too much information.
4. If people start to read slides, they generally find your mistakes. Aside from undermining your credibility, don't be surprised if the audience points them out to each other while you are speaking.

I have seen the suggestion that a slide should not exceed the "6 x 6" rule. That is, no more than 6 bullet points per slide and no more than 6 words in a line. Therefore, a slide should have no more than 36 words on the slide.

One final thought about graphs, spreadsheets or schedules on a slide. If you are going to cut and paste a 12 column by 10 row spreadsheet onto a slide, please don't bother – no one can see it. The same can be said for slides that contain a schedule in MS Project.

One way to present this information on a slide is to create a modified version of the schedule which has only the major points of the schedule on the slide. After all, the details of the schedule are going to be included in the report. If the viewer wants the details they can refer to the written report.

Another item that is often overlooked is that information that is "borrowed" from a source must be cited, just as in a written work. For example, if you were using Google Maps to show a view of the site, you need to cite the picture. The only time that you don't have to do this is if the image that is being shown is your original work.

Appendix E – NJIT University Policy on Academic Integrity

Section 1. Purpose New Jersey Institute of Technology is an institution dedicated to the pursuit of knowledge through teaching and research. The university expects that its graduates will assume positions of leadership within their professions and communities. Within this context, the university strives to develop and maintain a high level of ethics and honesty among all members of its community. Imperative to this goal is the commitment to truth and academic integrity. This commitment is confirmed in this NJIT University policy on Academic Integrity. The essential quality of this Policy is that each student shall demonstrate honesty and integrity in the completion of all assignments and in the participation of the learning process. Adherence to the University policy on Academic Integrity promotes the level of integrity required within the university and professional communities and assures students that their work is being judged fairly with the work of others. This Policy defines those behaviors which violate the principles of academic integrity, describes a range of appropriate sanctions for offenses, and identifies a method for promoting the principle of academic integrity on campus

- Section 2. Definitions Terms defined in the Student Code of Conduct also apply to the University Policy on Academic Integrity. Academic Dishonesty The list below contains some general parameters that define academic dishonesty. While the definitions include examples, the examples themselves cannot be listed exhaustively. Therefore, the list of examples is not all inclusive. Cheating is defined as:
- Intentionally using, providing or attempting to use or provide unauthorized assistance, materials, information or study aids in any academic exercise, or preventing, or attempting to prevent, another from using authorized assistance and/or materials.
- Copying answers from or looking at another student's exam.
- Using or possessing any material not expressly permitted during an exam, such as notes, books, prohibited calculators.
- Using electronic devices such as cell phones, digital cameras, PDA's, data storage devices, computers, internet, or other electronic devices unless expressly permitted.
- Having someone else take an exam for you or asking someone for answers to a test/exam.
- Possessing tests, notes, materials, or property belonging to or generating from faculty, staff, and students without permission.
- Submission of purchased term papers or projects done by others. Intentionally or knowingly helping or attempting to help another person commit an act of academic dishonesty.
- Working with others on a take home exam without instructor approval.
- Selling papers or exams.

- Taking an exam for someone else.
- Offering answers or information related to tests, exams, or assignments without prior instructor knowledge.

University Policy on Academic Integrity Fabrication is defined as:

- Intentional and unauthorized falsification or invention of any information or citation in any academic exercise.
- Citing nonexistent or irrelevant works.
- Making up citations on a bibliography or works cited page.
- Skewing data in accord with what you think results should be.
- Changing answers after an exam has been returned. Plagiarism is defined as: Using or attempting to use written, oral, or graphic work which was authored or prepared by another and submitting it as one's own without appropriate citation or credit. Intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise.
- Copying from a source without quotations or appropriate documentation.
- Copying from any source and altering a word or phrase to avoid exact quotation.
- Cloning someone else's ideas without attribution.
- Having someone else write a paper for you.
- Utilizing an image for a paper or project without attribution.

Section 3. Reporting, Investigation, and Adjudication Process

1. Faculty members will refer any allegations of Academic Dishonesty to The Dean of Students Office. If at any time, a student makes a charge of a violation of the Academic Integrity Policy concerning another student to an instructor, that instructor is obligated to report the matter to the Dean of Students without delay. If the maximum sanction for the alleged offense is below suspension, the Dean of Students reserves the right to appoint the Faculty member as the Investigator and/or Hearing Officer.

2. Faculty members who observe any cheating will confiscate all materials used in the alleged violation.

3. Dean of Students or designee will investigate the matter to determine whether a violation is likely to have occurred. While the initial report/allegation may be verbal, a signed written statement is required for adjudication.

4. If a student refutes the academic integrity allegation, the Dean of Students or designee will initiate the adjudication procedures. A hearing will proceed as outlined in the Student Code of Conduct.

5. Students who are accused of academic dishonesty will have the option to resolve the matter through an Administrative Hearing or a Hearing Board.

Section 4. Course Failure: XF Sanction System

1. A student who fails a course due to academic integrity violations will be assigned a grade of "XF" in that course and placed on probation for a period to be determined by the sanctioning authority. The "XF" will be treated in the same way as an "F" for the purposes of Grade Point Average, course repeatability, and determination of academic standing.

2. Once the probationary period has passed, the student may petition the Dean of Students Office to remove the "X" portion of the grade after successful completion of the Academic Integrity Seminar Series. The student will be assigned the series for the semester following the adjudication of the academic integrity allegation. A student will be permitted two attempts to successfully complete the Academic Integrity Series. If a student fails to successfully complete the Academic Integrity Series, the "X" will remain permanently.

3. Notation on the student's transcript shall read, "Failure due to Academic Dishonesty."

4. Students with the "XF" designation will be prohibited from officially representing the university, holding office in a student organization or representative body, and may be relieved from student employment at NJIT. 5. Students receiving more than one "XF" grade may be expelled from the university.

Section 5. Violation Levels and Sanctions

1. Violations Levels/Maximum Sanction Level 1. These are the most serious violations for which the sanction may result in expulsion from the university. Student organizations engaged in a violation(s) may face revocation of official recognition from the university. These violations of academic integrity generally, but don't necessarily have to, entail advanced planning, may include conspiring with others or involve a substantial part of credit awarded in the course (normally one third or more). Examples may include, but are not limited to:

a. Premeditated, conspiratorial cheating on any examination.

b. Taking an examination for another student.

c. Unauthorized obtaining or transmitting of examination material before an examination.

d. Plagiarizing, in full or significant/substantial part written, oral or graphic work which was authored or prepared by another.

Maximum Sanction: Expulsion. Level 2. These are serious violations for which sanctions may result in a suspension for one or two semesters from the university. Student organizations may face temporary suspension from the university. These violations of academic integrity generally, but don't necessarily have to, entail advanced planning or involve a significant part of credit awarded in the course (normally one quarter to less than one-third). Examples may include, but are not limited to:

a. Premeditated cheating on an examination.

b. Plagiarizing, in part, written, oral or graphic work which was authored or prepared by another.

d. Permitting one's work to be submitted by another student for his/her credit. d. Giving or receiving unfair aid in the completion of an assignment.

e. Maximum Sanction: Suspension and educational sanction. Level 3. These are violations which may result in failure of the course and mandatory attendance to the Academic Integrity Workshop Series. Examples may include but are not limited to: a. Cheating on an examination (not premeditated). b. Altering any work after it had been graded, and re-submitting it for further credit. c. Copying laboratory projects; falsely reporting, or tampering with laboratory data. d. Failing to acknowledge that the work submitted for credit is the work of a collaboration. e. Giving or receiving unfair aid in the completion of an assignment. f. Permitting another student to copy work during an examination. g. Submission of the same work for more than one course without the permission of the instructor(s). h. Using material prohibited from the examination, e.g. calculator when prohibited by Instructor.

f. Maximum Sanction: Failure in the course and/or suspension for one semester Level 4. These are violations which may result in the failure of the specific work submitted. These violations of academic integrity may occur because of ignorance or inexperience on the part of the individual(s) committing the violation and involve a minor part of the credit awarded in the course. Examples include:

a. Copying minor homework assignment(s) and submitting same for credit.

b. Failure to properly acknowledge or document references on submitted work which represents a minor part of the credits to be awarded in the course.

c. Impeding student access to reference material, i.e. keeping referenced material

d. Giving or receiving unfair aid in the completion of an assignment. Maximum Sanction: Failure in the specific work submitted and educational sanctions.

2. List of Possible Sanctions - Sanctions include, but are not limited to, one of more of the following and may, but need not, involve suspension or expulsion:

- Failure of a course.

- A grade of XF for the course

. • Failure in specific work submitted.

- Disciplinary probation.

- Required attendance to the Academic Integrity Workshop Series.

- Suspension for one or more semesters.

- Permanent expulsion from the University with a permanent notation of disciplinary expulsion on the student's transcript. Sanctions for a given violation may be imposed differently on those with more or less experience as students. Thus, violations of academic integrity by graduate students may be penalized more severely than the same violations by inexperienced undergraduate students.