CIVE 495 Capstone Design Project  
Course Syllabus - Fall 2013

The Course is **3 Credit Hours** and has the following mandatory **Pre-Requisites (no exceptions):**

- For Civil Engineering Students (2 can be taken concurrently)  
  CIVE321, CIVE444, CIVE462, CIVE481, ENVE355
- For Construction Engineering Students (both can be taken concurrently)  
  CONE480, CONE490
- For Environmental Engineering Students (2 can be taken concurrently; except CONE430)  
  CONE430, ENVE441, ENVE442, ENVE554, ENVE556, ENVE558

**Lectures/Lab Sessions**
Lecture: Friday 1:00–1:50pm, Room IT-101  
Lab: Friday 2:00–4:40pm, Room IT-101 (PS-231 is open for CCEE students)

**Faculty Information**
Name: **Jim Haughey, P.E.**  
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Name: **John Prince, P.E.**  
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**Add'l Contact (ENVE)**  
Varies by the project

**Required Text**
None

**Course Description and Objectives**

**Catalog Description:** Application of engineering principles and design techniques to the design of civil engineering projects.  

**Course Content:** Students will be separated into teams, with each team facing a range of issues within multiple traditional disciplines of civil, construction and environmental engineering: (1) **construction,** (2) **environmental,** (3) **geotechnical,** (4) **structural,** (5) **transportation,** and (6) **water resources** (stormwater/water/wastewater), or a deeply focused issue within a single discipline and an approach similar to practice. All teams will produce a practice-oriented result.

Teams will be assigned based on student interest and availability to a range of projects to be distributed separately. You will be provided additional information after the distribution of student focus disciplines is known and groups are formed. When forming teams and establishing roles, keep in mind that some prior experience to the subject is required (i.e. if you are acting as the structural engineer, make sure you have taken structure engineering courses). This is important as the faculty and industry advisors are there to provide general guidance on performing real-world analysis, not to teach you basics of the subject. Also keep in mind the weekly schedules of the individuals in your group, so as to make sure there is time throughout the week that you are all available to get together.

**Course Goals and Objectives**
Design a significant civil engineering project, from beginning to end. Work with different civil engineering disciplines, as a team, to produce the final best project for the given site and project constraints. Understand the relationship between initial concepts, design, construction, environmental concerns, time to complete the project and cost.
Instructional Methods
The course will rely heavily on student’s independent study. Student teams will develop a plan to approach their problem, and will account to the instructors for their progress against that plan. Students may select a mentor from the faculty for their work. In addition, we will help to provide mentors from industry. Class meetings will include a lecture, which may include a case study from a practitioner, or review material common to several teams and will require one member from each team to provide a Progress Report and be available for questions by the instructors. The content of an individual class will be posted on blackboard and announced in class the week prior. The class may not meet every week, but students will still be accountable for and expected to make progress.

Getting a College Computer Account and Access to PS231
The lecture and laboratory sessions are held in room IT-101 and do not contain computers. Occasionally, class may meet in PS-231 and E-220 with computers. Students are also free and encouraged to use the computers available during class time or throughout the week. Access to the computers requires an Engineering2 user login. To obtain a user account, see Sandy Maxwell in the Civil Engineering Department office or go to the Engineering Computer Help Desk on the second floor of the Engineering building. To enter PS-231, you must have a 6-digit door code. You can get this code from Sandy in the main CCEE office.

Course Polices - General
You are expected to be prepared for and attend the lecture portion of class. This means completing all assignments and having prepared questions or areas where you need help, with documentation of your own efforts and clear definition of where you are stuck, before class. Due to the importance of lecture information to deliverables and industry standards, students will be required to attend lectures and sign-in at the beginning of each lecture. Lecture attendance will be part of the student’s overall grade for class as is shown below in the grading factors. Supplemental information or changes in assignment responsibilities will be discussed in class, and may not be conveyed to you by other means. Students may use Lab time at their discretion. When the instructors meet with groups individually during the lab portion of class-time, you are encouraged to utilize that time to work on your projects.

It is expected that you will conduct yourself in a courteous, professional, and ethical manner at all times. Students will not use computers for non-course related activities during class. Cell phones cannot be used and ringers must be off during class.

Communication from the Instructors
The instructors will send emails or post announcements, addendums, or corrections on Blackboard. It is the student’s responsibility to ensure that the webportal email address that blackboard uses is an accurate email, and the student’s responsibility to regularly check that email box.

Grades will be approximately weighted as follows:
California PE Take Home Exam Completion (http://www.pels.ca.gov/applicants/pe_takehome.pdf) Required
Lecture Attendance (Individual) ~10%
Progress Plan and Reports (Group) ~10%
Final Design Day Presentation (Group) ~20%
Final Design Video (Group) ~10%
Final Design Deliverables (Group) ~40%
Group Assessments (Individual) ~10%
Total 100%

Note that although the projects form the majority of your grade, your group members will assess for us the value of your individual contribution to the group, and we will grade some material specific to each student’s work. Thus it is possible, indeed likely, that students in the same group will earn different grades. Your final grade is an overall evaluation and consideration of all elements of the class, as opposed to a summation of points.
Class and Deliverable Schedule

[Group A-John, Group B-Jim]  
(Subject to change at any time, check Blackboard. All deliverables are due at the beginning of class)

Phase I - Project Planning
Aug 30 – Intros, Outcomes, Review Syllabus and Projects, Team and Project Selection, Project Plan Intro  
Sep 6 (B) – Lecture: Project Planning & Brainstorming  
Sep 13 (A) – Lecture: Deliverables ................................Draft Project Plan due  
Sep 20 (A/B) – Project Plan Presentations.....................Project Plan due

Phase II - Preliminary Study
Sep 27 (B) – Technical Guest Lecture.................................Progress Report #1 due  
Oct 4 (A) – Technical Guest Lecture .................................PE Take Home Exam, PR #2 due  
Oct 11 (B) – Technical Guest Lecture ...............................Progress Report #3 due  
Oct 18 (A) – Lecture: Deliverable Milestone Expectations........Progress Report #4 due  
Oct 25 (B-open) – Technical Guest Lecture..........................50% Design Submittal due

Phase III – Final Design
Nov 1 (A/B) – 50% Submittal Feedback ..............................Progress Report #5 due  
Nov 8 (B) – Additional 50% Thoughts/Outcomes...............Progress Report #6 due  
Nov 15 (A) – Lecture: Prof Licensure/Presentation Skills........Progress Report #7 due  
Nov 22 (B) – Lecture: Project Delivery Methods...............Progress Report #8 due  
Nov 29 - Thanksgiving (no class)

Final Submittals and Presentations
Dec 6 – Design Day, Presentation Boards and Final Submittal (at Design Day)  
Dec 13 - Presentation Video and Group Assessments (emailed by midnight)

Description of Deliverables
Notice on the Class Schedule that the semester is divided into three distinct parts or phases; 1. Project Planning, 2. Preliminary Design, and 3. Final Design. A major deliverable is due at the end of each phase as described below.

1. Project Planning – During the first phase of the course, teams shall prepare a project plan to include the planning documents for execution and completion of your project deliverables. In developing the project plan, the team will evaluate and determine the project goals and objectives, develop a problem statement, and perform research to better understand the project.

   **Project Plan**
   The team will develop their design approach and summarize all details of the project. The project plan shall contain a detailed schedule, containing milestones for intermediate deliverables and a responsibility matrix establishing the roles and assignments of each group member. The project plan shall also include a team pledge created and signed by each team member. The project plan will form the basis of the weekly progress reports.

   It is highly recommended that the team seek out industry and faculty advisors to help develop the project plan and serve as a resource for the rest of the semester. Suggested industry contacts will be provided, but teams are not required to use only these contacts. In contrast, teams are highly encouraged to seek assistance from agencies and industry outside of the classroom and instructors.

   **Project Plan Presentation**
   At the completion of the Project Planning stage, each team shall present their project plan to the class for feedback. Presentations shall be limited to 5-10 minutes.
2. **Preliminary Study** – Upon completion of the Project Plan, teams should have a good understanding of the project, the work involved and the roles of each team member, much of the research completed, and appropriate industry and faculty contacts to help guide students in their work. During the Preliminary Study phase, teams will complete research and begin to study and analyze the various project elements. The studies, plans, and ultimate design submittal should start to take form, at least in outline/draft form in order to document background data, assumptions, findings, results, and conclusions. At the completion of the Preliminary Study, all constraints and basic design issues should be identified and resolved to facilitate preparation of the final design.

**California P.E. Take Home Exam**
As servants to public welfare, it is important that Professional Engineers maintain high ethical standards. To introduce students into the importance of ethics and into the process of applying to become a Professional Engineer, each student is required to complete the PE Take-Home Exam, which can be found here: [http://www.bpelsg.ca.gov/applicants/pe_takehome.pdf](http://www.bipelsg.ca.gov/applicants/pe_takehome.pdf). This is an individual assignment. The exams will not be graded. Completing and turning the completed exam onto Blackboard is a required element of the class.

**50% Design Submittal**
This is the milestone/progress submittal of the Final Design Submittal. This submittal should have the same table of contents and content as the Final Design Submittal, with blanks for those materials not yet completed. The general outline and content of the submittal must be approved by the instructors prior to preparing the submittal. On the day of submittal, a single hard-copy and a PDF version of the report shall be submitted at the beginning of class. The submittal will be returned to you along with comments and feedback at the next class session.

3. **Final Design** – Your hard work throughout the semester culminates in the submission of a Final Design report, Design Day “presentation”, Presentation Video, and final group assessment; all due per the class schedule.

**Final Design Submittal**
This is the final Design Submittal for the class. It should include detailed documentation of the design effort and the final design, with appendices with all backup calculations (including failed attempts). Content and focus of the submittal will vary by each project and group. The instructors or advisors shall be consulted and approve of the content to be provided. The final submittal should address the review comments by the instructors from the 50% Submittal. The final submittal should also document the group’s impressions of the sustainability of their design, with an estimate of the life cycle cost of their project or proposed policy, and make a business case for the project, and present a summary of potential social, environmental, or cultural objections to the project. A single hard-copy of the final submittal is due at the Design Day event and will not be returned.

**Design Day Display/Presentation Board(s)**
Teams must be prepared to present their work to faculty, industry and lower division students at the semester ending “Design Day” event. The Design Day event is an open showcase type event, where each team is provided a 6-ft table. Attendees of the event walk around to visit each team in an open format. Each team shall provide a presentation board showing the details of the project. Additional display materials are encouraged. Details of the event will be provided in class.

**Presentation Video**
One week following the Design Day event, each team shall prepare a presentation in digital form, not to exceed 12 minutes in length or as allowable to post onto YouTube. Videos should address the project, team members, roles, design approach, findings, results, and conclusions. Imagine that the presentation is presented to or given to a City Council to describe and sell your project. Creativity is encouraged.
**Group Assessments**
Performance assessments are to be completed by each member of the group to evaluate the efforts of the other members of your group (including yourself) and are to be confidentially submitted to the instructors via Blackboard.

Other Deliverables required include:

**Progress Reports** – Throughout the semester, a Progress Report is due at the beginning of class. These will be submitted by a rotating assignment within your group (one person for the group each week). They will describe your progress against the milestone schedule in Item 1, summarize any changes to your approach, highlight any areas that are running late and explain how you propose to catch up, outline any specific challenges the group is currently facing, and indicate the proposed tasks (by group member) for the coming week. This will be delivered to class each week as shown in the class deliverable schedule, and the group member responsible that week should be available for questions by the instructors.

To provide more detailed feedback to each group, there will be alternating weeks of “Instructor Review” of Progress Reports for identified teams. For teams NOT scheduled for Instructor review, they are required to meet with an academic advisor the previous week. The meeting(s) with academic advisors are NOT intended to have academic advisors review Progress Reports, but rather, are intended for teams NOT getting Instructor Reviews to get technical advice and direction from University Staff. Accordingly, those teams that meet with academic advisors must show Instructors the date and time of meeting with advisors to get credit for the Progress Report. Progress Reports shall be compiled in a binder and “added-to” each week.

**Relationship of Course Outcomes to Program Outcomes**
This course is one of many that you will take towards your degree in Civil, Construction or Environmental Engineering. Each of our courses is designed to prepare you for your careers in Civil Engineering, and to contribute to some specific Program Outcomes. Program Outcomes are statements that describe what students are expected to know and are able to do by the time of graduation. Each course in the curriculum emphasizes particular aspects of the overall body of knowledge you are expected to acquire. Although other outcomes may also be addressed, this course is intended to have a particular emphasis on the following Program Outcomes. For each numbered Program Outcome, the course-specific interpretation is shown as the indented lettered Course Outcomes that will be used for assessment.

**Outcome 1:** Apply knowledge if mathematics through differential equations, calculus-based physics, chemistry and life science.
Assessed by: Design and Progress Reports

A. *Demonstrate an ability to apply fundamental engineering and science principles in a design project.*

**Outcome 2:** Drawing upon a broad education, explain the global, economic, environmental, and societal impacts of a specific, relatively constrained engineering solution.
Assessed by: Design and Progress Reports

A. *Determine potential global, economic, environmental, and societal impacts that may arise from the project.*

**Outcome 3:** Explain how contemporary issues affect the identification, formulation, and solution of engineering problems.
Assessed by: Design and Progress Reports

A. *Explain the key contemporary issues that affected this project and how they were addressed.*

**Outcome 4:** Design a complex system or process to meet desired needs, within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
Assessed by: Design and Progress Reports
A. **Design** the proposed project elements given a set of specific deliverables and challenges.

**Outcome 6:** Apply knowledge of four technical areas appropriate to civil engineering to identify, formulate, and solve engineering problems.

Assessed by: Design Presentations and Reports

A. **Demonstrate** an ability to solve engineering problems in a multi-discipline design project.

**Outcome 7:** Function effectively as a member of a multi-disciplinary team.

Assessed by: Design Presentations and Reports

A. **Participate** in a group project requiring individuals to perform discipline specific design tasks and coordinate their results with other disciplines.

**Outcome 8:** Organize and deliver effective verbal, written and graphical communications.

Assessed by: Design Presentations and Reports

A. **Produce** a preliminary and final design submittal that documents the problem statements, data analyses and results interpretation using written and graphical communications.

B. **Prepare and Present** their preliminary and final designs to students, faculty and professionals.

**Outcome 9:** Apply relevant techniques, skills, and modern engineering tools to solve a simple problem.

Assessed by: Design and Progress Reports

A. **Use** a variety of software applications (AutoCAD, GIS, Spreadsheets, MathCAD, SAP2000, scheduling software) to display, manipulate, design and analyze project elements.

**Outcome 10:** Analyze a complex situation involving multiple conflicting professional and ethical interests, to determine an appropriate course of action.

Assessed by: Design and Progress Reports

A. **Analyze** a multi-discipline problem and resolve conflicts between disciplines.

**Outcome 11:** Recognize the need for and **prove** and ability to engage in life-long learning and explain the importance of professional licensure.

Assessed by: Design and Progress Reports

A. **Demonstrate** an ability to share relevant knowledge among team members on a multi-discipline design project.

**Outcome 12:** Explain key concepts and problem-solving processes used in management.

Assessed by: Design and Progress Reports

A. **Demonstrate** a practical application of relevant managerial skills in multi-discipline design project.

**Outcome 13:** Explain key concepts and problem-solving processes used in business, public policy, and public administration.

Assessed by: Design and Progress Reports

A. **Demonstrate** an ability to properly address relevant business and public policy issues encountered in a multi-discipline design project.

**Outcome 14:** Explain the role of a leader, leadership principles, and attitudes conducive to effective practice of civil engineering.

Assessed by: Design and Progress Reports

A. **Explain** the roles and contributions of each group member in their project.

B. **Explain** how their group performance could have been improved.