

*The University of British Columbia  
Department of Civil Engineering*

**CIVL 445 – ENGINEERING DESIGN AND ANALYSIS I**

**COURSE FORMAT AND EXPECTATIONS**

*Issued: August 20, 2015*

**CALENDAR ENTRY**

**CIVL 445 (3) Engineering Design and Analysis I.** Integration and application of previously acquired knowledge and skills to find design solutions. Focus on conceptual designs. [2\*-0-4]  
*Prerequisite:* APSC 201 and fourth-year standing.

**COURSE OVERVIEW**

This is the first of two capstone design courses for students in the 4th year of the Civil Engineering program, intended to support preparation for professional practice. CIVL 445 entails a conceptual and preliminary design of a specific project relating to civil engineering infrastructure, and relies on the knowledge and skills developed in the Civil Engineering program to date. It is expected that the project design will integrate technical, economic, community and environmental considerations. The companion course, CIVL 446, relates to the detailed design of a project.

During this capstone design course, learning is accomplished as part of a six-member design team responding to a specified assignment drawn from civil engineering practice. The course is focused on the submission of specified deliverables that include a project proposal, a conceptual design presentation and summary report and a preliminary design report.

**ENGINEERING DESIGN**

The focus of CIVL 445 and CIVL 446 is on providing a capstone experience in engineering design. The Canadian Engineering Accreditation Board defines engineering design as: *an activity that integrates mathematics, basic sciences, engineering sciences and complementary studies in developing elements, systems and processes to meet specific needs. It is a creative, iterative and often open-ended process subject to constraints, which may be governed by standards or legislation to varying degrees depending upon the discipline. These constraints may relate to economic, health, safety, environmental, social or other pertinent interdisciplinary factors.*

Courses to date have sought to develop knowledge and skills in mathematics and the natural sciences in the context of solving engineering problems, and in technical aspects of civil engineering relating both to analysis and design, and including aspects associated with uncertainties. They have also sought to provide exposure to the communications, societal, economic and environmental contexts of engineering work. As a capstone design experience, these two courses are intended to provide the opportunity to integrate the knowledge and skills

developed within the program to date into all stages of a civil engineering project in the context of engineering practice.

The engineering design process may include several components including conceptual design, preliminary design and detailed design. These steps are often preceded by proposal development responding to requests for proposals. CIVL 445 focuses on proposal development, conceptual design and preliminary design, and seeks to reflect the breadth of civil engineering by involving several of the key sub-disciplines of civil engineering. Particular attention is given to stakeholder interactions, and to social, environmental and economic aspects of design. The companion course CIVL 446 continues with the detailed design of a civil engineering project.

### **CAPSTONE DESIGN, ATTRIBUTES AND LEARNING OUTCOMES**

The key features of the capstone design experience, the graduate attributes to which this course contributes, and the learning outcomes of the course are being issued through a separate statement.

### **SUMMARY FORMAT AND SCHEDULE**

The course will be delivered through a series of plenary sessions, review meetings with course instructors, tutorial meetings, the development of four individual and team-based deliverables, and the evaluation of these deliverables and of other assessment tools.

Summary schedule:

Lectures / plenary sessions: Mon: 3:00 - 5:00 pm, FRDM 153

Review meetings / tutorials: Tue: 8:00 - 9:30 am: see detailed schedule  
Thu: 8:00 – 9:30 am: see detailed schedule

**Note: the first plenary session will take place on Thursday, September 10 in SWNG 221.**

During scheduled class times, activities will fall into one of three categories:

- ***Plenary Sessions.*** The class meets as a whole, and information is delivered by instructors or guest lecturers on the course, the selected projects and non-technical aspects of engineering design.
- ***Review Meetings.*** Each team meet with a designated design instructor to review progress in the course and towards the development of various deliverables.
- ***Tutorials.*** Teams work on their own, with a Teaching Assistant available for informal consultations, and/or any team may request in advance an informal meeting with any instructor during these sessions.

In addition, scheduled class times have also been set aside to provide time for student teams to undertake site visits, and to schedule the required conceptual design presentations.

## INSTRUCTIONAL TEAM

The instructional team for this course includes a team of six instructors, two teaching assistants, and three client representatives.

### Instructor Roles

The instructors for the course are as follows:

- Dr. Yahya Nahzat (projects leader): ynazhat@civil.ubc.ca
- Dr. Michael Isaacson (course coordinator): isaacson@apsc.ubc.ca
- Dr. Ruth Derksen (communications instructor): ruth.derksen@ubc.ca
- Dr. Loretta Li (design instructor): lli@civil.ubc.ca
- Dr. Don Mavinic (design instructor): dsm@civil.ubc.ca
- Dr. Susan Nesbit (design instructor): nesbit@civil.ubc.ca

The roles of the instructional team members include the following:

- The *Projects Leader*, Dr. Nahzat, is responsible for all aspects of the projects, including their descriptions, scopes of work, supporting information and data, and liaison with clients.
- The *Course Coordinator*, Dr. Isaacson, is responsible for all aspects of course organization including team formation, project selection, scheduling, guest presentations, use of Connect and the development and use of assessment tools.
- The *Design Instructors*, Drs. Li, Mavinic and Nesbit, are responsible for providing review and advice to student teams with respect to the development of their projects and deliverables, primarily through participation in review meetings.
- The *Communications Instructor*, Dr. Derksen, leads a team of three instructors who are responsible for providing review and advice to student teams with respect to the formatting and communications aspects of their projects and deliverables, primarily through participation in review meetings.

### Interactions with Instructors

- All documentation will be provided to students via Connect (connect.ubc.ca). All student submissions should be made via Connect, except as may be otherwise indicated.
- Instructors may make critical announcements during plenary sessions and these will be deemed to have been conveyed to all students. The course coordinator may also issue critical announcements via e-mail.
- Each student team will have periodic review meetings with a design instructor or a communications instructor to review progress and to seek advice in the development of their deliverables.

- The instructors do not maintain specified office hours. Students may e-mail requests for informal discussions with any instructor, usually to take place during the scheduled tutorial sessions. Normally, instructors should be contacted as follows: Dr. Isaacson for course organizational aspects, including team arrangements and roles; Dr. Nahzat for queries to be directed to the clients, for the use of dedicated software and for other aspects of the projects; Drs. Li, Mavinic and Nesbit for queries relating to the development of the deliverables, including all aspects of the relevant projects; and Dr. Derksen for formatting and communications aspects of the deliverables.

### **Teaching Assistants**

Two Teaching Assistants support the organizational and assessment aspects of the course. As well, a Teaching Assistant will be available at all tutorial sessions to provide informal advice and discussion with student teams. The Teaching Assistants may be contacted via [civl445ubc@gmail.com](mailto:civl445ubc@gmail.com) (not "civil"). Some student submissions will be required through this e-mail address.

### **Client Representatives**

The client representatives have established the projects and the scope of work, they will provide an overview of the project, they will provide additional information and data relating to the project as may be available, and may respond to specific questions from student teams. In order to minimize the involvement of the client representatives in this course, team members should direct any questions intended for clients via Dr. Nahzat ([ynazhat@civil.ubc.ca](mailto:ynazhat@civil.ubc.ca)).

### **CONNECT**

The majority of the communication for the course will take place using UBC's Connect, to which all students registered for the course should have access. Connect will be used primarily for the posting of documents and the submission of deliverables. Students are encouraged to monitor the Connect site on a regular basis, as material may be added or updated throughout the term.

### **DELIVERABLES**

The course will include student submission of four deliverables: a logbook (individual deliverable), a project proposal, a conceptual design presentation and summary report, and a preliminary design report (team deliverables). Detailed instructions and guidelines for each of these four deliverables will be provided to students on Connect.

### **COURSE EVALUATION**

Student grading will be based on the marking scheme provided below. 30% of the marks for the course will be allocated on the basis of individual assessments, and 70% on the basis of student team assessments.

### Individual Assessment

• Attendance		5%
• Logbook		7%
• Conceptual design presentation – individual component		5%
• In-class quiz		7%
• Contribution to team deliverables and teamwork		<u>6%</u>
<b><i>Total – individual assessment</i></b>		<b>30%</b>

### Team Assessment

• Project Proposal			
○ Format & visual quality	4%		
○ Content	6%		
○ Total	10%		10%
• Conceptual Design Presentation & Report			
○ Format & visual quality	5%		
○ Content	15%		
○ Total	20%		20%
• Preliminary Design Report			
○ Format and visual quality	10%		
○ Content	30%		
○ Total	40%		<u>40%</u>
<b><i>Total – team assessment</i></b>			<b>70%</b>
<b><i>Overall total</i></b>			<b>100%</b>

### PROFESSIONAL CONDUCT

This course is organized to reflect the working methodology of civil engineers in professional practice. It is expected that all students will act in a professional manner, working in cooperative teams and respecting the opinions of their peers. Students are expected to adhere to the following element of the APEGBC Code of Ethics: "*(They should) conduct themselves with fairness, courtesy and good faith towards clients, colleagues and others, give credit where it is due and accept, as well as give, honest and fair professional comment.*" Students are expected to uphold professional integrity and honesty with respect to their individual contributions and peer assessments. All deliverables should be presented in a professional manner, and will be graded on content and presentation, including standards of English.