



Board/Authority Authorised Course Civil Engineering Concepts 1

School District/Independent School Authority Name	Kamloops/Thompson
School District/Independent School Authority Number	#73
Developed by	Briar Beers
Date Developed	December 2013
School Name	NorKam Secondary School
Principal's Name (District)	Sheryl Lindquist
Superintendent Approval Date (for School Districts only)	
Superintendent Signature (for School Districts only)	
Board/Authority Approval Date	
Board/Authority Chair Signature	
Course Name	Civil Engineering Concepts 1
Grade Level of Course	11 and 12
Number of Course Credits	4
Number of Hours of Instruction	120
Prerequisite(s)	Completion of Grade 10



Synopsis

This course has been developed to support and provide students with an opportunity to explore the basic concepts that would be studied and used in practice by students and graduates of the Civil Engineering Technology and Civil Engineering Degree programs. The sampler is used to allow students to understand what these programs will be like and what type of work is available in these professions. In the Civil Engineering Concepts 1 course, students will be exposed to many of the standard topics they would be exposed to in the Civil Engineering/Technology Program and in the workplace. This course is intended to assist students in their post-secondary education choices by exposing them to some options, as well as give those who do end up attending the Civil Engineering Degree or Diploma Programs, a head start to help them be successful.

Rationale

1. Provide students with an overview of the Civil Engineering Degree and Technology Diploma courses and what potential career paths they may have, as well as acceptance requirements, school choices, and what to expect there.
2. Provide students with an introduction to surveying practices that are currently used in the field. They will be exposed to both Leveling and Total Station surveying.
3. Provide students with an overview of professional writing and technical reports to prepare them for both post-secondary education and the work force.
4. Provide students with the technical ability to read different types of construction drawings accurately which will be preparing them for post-secondary education or directly working in the field.
5. Provide students with as much hands-on, practical, learning as possible, by providing the tools used in the workplace in order to gain a working knowledge.
6. Provide students with a basic understanding of AutoCAD drafting to expose them to practical engineering career options and background knowledge.

Unit/Topic	Title	Time
Unit 1	Introduction to Civil Engineering	15 hours
Unit 2	Surveying – Level and Total Station	40 hours
Unit 3	Composing Professional Documents	15 hours
Unit 4	Reading Construction Drawings	40 hours
Unit 5	Introduction to AutoCAD	10 hours
	Total Hours	120



Unit 1 – Introduction to Civil Engineering

Objective: In this unit, students will learn the different career options for Civil Engineers and Civil Engineering Technologists. They will have an understanding of the different educational options and requirements.

Prescribed Learning Outcomes

1. Identify the differences between the Civil Engineering Degree Program and the Civil Engineering Technology Diploma Program.
2. Identify the admission requirements for both degree and diploma programs.
3. Define the different areas of civil engineering:
 - Structural
 - Water resource
 - Transportation
 - Environment
 - Construction Management
 - Municipal or Urban
 - Materials Science
 - Coastal
 - Earthquake

Unit 2 – Surveying

Objective: In this unit, students will learn the basics of surveying, including levelling, taping, total station and transit and angles. Students will be able to perform surveying tasks and calculations on their own and understand the theory behind it.

Prescribed Learning Outcomes

Students will acquire skills related to identification and use of:

Levelling

- Define commonly used surveying words and phrases, and identify their acronyms:
 - Levelling
 - Bench mark (BM)
 - Temporary Bench mark (TBM)
 - Turning Point (TP)
 - Height of Instrument (HI)
 - Backsight (BS)
 - Foresight (FS)
 - Intermediate Foresight (IFS)
- Understand and demonstrate basic theory of surveying
 - How to set up the level and tripod
 - How to use a backsight and foresight



- Identify a levelling rod and know how to use it
- Understand what a bench mark is and what it is used for
- Complete levelling calculations:
 - Demonstrate height of instrument calculations
 - Demonstrate turning point calculations
- Demonstrate the ability to complete general levelling practices.
 - Booking work correctly in a survey book
 - Correctly arranging the cross hairs of the level
 - Proficiently read the levelling rod
 - Understand and complete the duties of a rod person

Taping and Transit

- Define common words and phrases associated with taping and transit use:
 - Taping
 - Traverse/traversing
 - Angles

Total Station

- Identify and label the parts of the total station, i.e.:
 - Handle securing screw
 - Instrument height mark
 - Operation panel
 - Base plate
 - Levelling foot screw
 - Circular level adjusting screws
 - Circular level
 - Display
 - Objective lens
 - Telescope eye piece
 - Telescope focus ring
 - Peep sight
 - Data input/output connector
- Describe and define components of the total station:
 - Electronic distance meter (EDM)
 - Electronic theodolite (electric transit)
 - On-board microprocessor
 - Data collector (built in or separate unit)
 - Data storage (internal or external memory)
 - Prisms
- Explain how the total station measures:
 - Coordinate measurements
 - Angle measurements
 - Distance measurements



- State possible sources of error when using total station:
- Demonstrate setting up and levelling of:
 - Tripod
 - Total station instrument
- Demonstrate correct use of total station in surveying and data collection.

Unit 3 – Composing Professional Documents

Objective: This unit will allow students to develop technical and professional document creation skills. These skills will be preparing them for any post-secondary education as well as the professional work environment.

Prescribed Learning Outcomes

Students will acquire skills related to identification and use of:

1. Demonstrate ability to create a:
 - Professional resume
 - Professional memorandum
 - Professional letter
 - Technical report (including tables, exhibits, and references)
2. Demonstrate proficiency in:
 - Microsoft Word
 - Microsoft Excel

Unit 4 – Reading Construction Drawings

Objective: This unit will allow students to develop their knowledge, background, and general understanding of construction drawings (blueprints).

Prescribed Learning Outcomes

At the completion of this course, students will be able to:

1. Identify and correctly use scales in both Imperial and Metric.
2. Identify and read legends and symbols on drawings and be able to locate the symbols on the drawings.
3. Demonstrate the ability to read dimensions.
4. Locate and identify bench marks on drawings.
5. Identify and understand different types of drawings:
 - Civil
 - Structural
 - Architectural
 - Electrical
 - Mechanical
 - Plumbing
 - Structural framing



6. Understand and identify different classifications of drawings.
 - Plan
 - Elevation
 - Section
 - Details
 - Fabrication drawings
7. Identify detail identifiers and section cutting lines and locating the associated drawings.

Unit 5 – Introduction to AutoCAD

Objective: In this course, students will be exposed to the drafting program AutoCAD. They will learn the basic features of the program and will be run through basic tutorials to develop basic drafting skills.

Prescribed Learning Outcomes

Students will acquire skills related to identification and use of:

1. Demonstrate how to set up a new drawing.
2. Demonstrate how to set up layers for drawings.
3. Demonstrate how to use dimensioning in their drawings.
4. Demonstrate how to use a title block and fill in the information accurately.
5. Take measurements off an existing drawing that was not dimensioned.

Instructional Component

- Direct instruction
- Indirect instruction
- Project-based Learning
- Research
- Interactive (peer) instruction
- Independent instruction
- Modeling
- Practical creativity
- Brainstorming
- Group work
- Analysis of own and classmates' project work

Assessment Component

The assessment breakdown is located below. As much as possible, the assessment for all units will be as practical and hands-on as possible. Completing activities hand-on and then submitting projects and reports based on that information will be one of the main sources of assessment. There will be some quizzes to reiterate some important and crucial information conducted as necessary.



Unit	Title	Assessment Components	Percentage
Unit 1	INTRODUCTION TO CIVIL ENGINEERING	<ul style="list-style-type: none"> • Research • Quizzes • Class discussions • Written Assignments 	10%
Unit 2	SURVEYING – LEVEL AND TOTAL STATION	<ul style="list-style-type: none"> • Projects • Practical skills demonstration • Quizzes • Written Assignments 	30%
Unit 3	COMPOSING PROFESSIONAL DOCUMENTS	<ul style="list-style-type: none"> • Written Assignments • Projects based on practical data 	10%
Unit 4	READING CONSTRUCTION DRAWINGS	<ul style="list-style-type: none"> • Practical Demonstration • Project Based • Quizzes 	30%
Unit 5	INTRODUCTION TO AUTOCAD	<ul style="list-style-type: none"> • Tutorial Completion • Demonstration Assignments • Written assignments • Projects • Quizzes 	20%
	Total		100%

Facility Requirements

Classroom Area

- Comfortable seating and tables suitable for learning
- Compliance with the Local and National Fire Code and occupational safety requirements
- Meets applicable municipal zoning bylaws for technical instruction and education facilities
- Overhead and multimedia projectors with a projection screen and associated computer tablet equipment capable of a Bluetooth connection (i.e., No cable connection required, tablet can be used anywhere in the classroom)



- Whiteboard with marking pens and erasers
- Lighting controls to allow easy visibility of the projection screen while allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/air conditioning for comfort all year round
- Acoustics in the room must allow audibility of the instructor

Computer Lab Requirements

- Minimum 25 computers or laptops
- Table top space available at each station to accommodate project work on the desk while working at a computer
- All computer will be equipped with AutoCAD Program, Microsoft Word, Microsoft Excel, and Microsoft Project

Student Facilities

- Adequate eating area as per WorkSafeBC requirements (4.84 OHS Regulation and Guidelines)
- Adequate washroom facilities as per WorkSafeBC requirements (4.85 OHS Regulation and Guidelines)
- Minimum 10 cu. ft. personal storage lockers

Instructor's Office Space

- Adequate office space for student consultation
- Desk and filing space
- Computer
- Internet access
- Printer access
- Adequate storage facilities for material and training aids
- Access to photocopier/scanner
- Telephone

Tools and Equipment

Required Shop Equipment: Equipment List is based on the standard class size of 25 students. The facilities must be suitable for instructional use.

- 15 - Builders Levels
- 15 - Level Rods
- 2 – Complete Total Stations
- 10 - Plumb bobs
- 15 - Measuring tapes
- Computer software for total station
- 30 - 12" Architect Scale Rulers - 16, (1/8, ¼), (3/32, 3/16), (3/8, 3/4), (½, 1), (1½, 3)
- 30 - 12" Engineer Scale Rulers - 10, 20, 30, 40, 50, 60 parts per inch
- 30 - 30cm Metric Architect - 1:100, 1:200, 1:250, 1:300, 1:400, 1:500



- 30 - 30cm Metric Engineer - 1:1, 1:2, 1:5, 1:10, 1:20, 1:50
- 30 - 30cm Metric Mechanical - 1:20, 1:25, 1:50, 1:75, 1:100, 1:125
- 30 - Calculated Industries 6025 Scale Master Pro Digital Plan Measure (or equivalent)
- 25-30 - Computer stations with CD-ROM, modem, software, etc.
- 1 – Printer

Required Student Tools (supplied by student)

Contact Training Facility for recommended tools and equipment that students need to supply.

Reference Materials

Industry Training Authority (ITA), www.itabc.ca

BC Construction Industry Training Organization www.bccito.com

WorkSafeBC, Workers' Compensation Board of BC (WCB), www.worksafebc.com

Workplace Hazardous Materials Information System (WHMIS), www.hc-sc.gc.ca