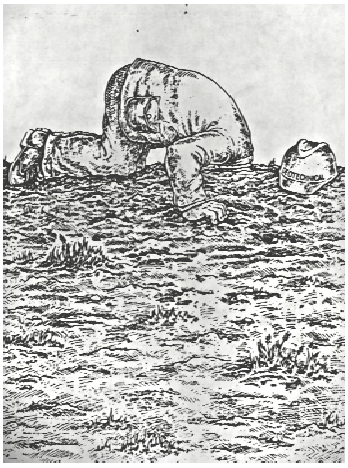
CIV E 353
Geotech Engineering I

Winter 2006

Dr. Mark Knight

Geotechnical Engineer



Course Instructors

- Lectures:
  Dr. Mark Knight E2-2343A
- Laboratory Sessions:
  Ken Bowman E2-2342A
- Tutorials and Labs:
  Adedamola Adedapo Office: E2-2342F
  E-mail:aadedap@engmail.uwaterloo.ca
  Rizwan Younis Office: E2-2342E
  E-mail: ryounis@engmail.uwaterloo.ca

CIVE 353

Lecture Periods

Monday, Wednesday and Friday at 9:30 AM (CPH 3385)

Tutorial

Friday at 1:30PM (CPH 3385)

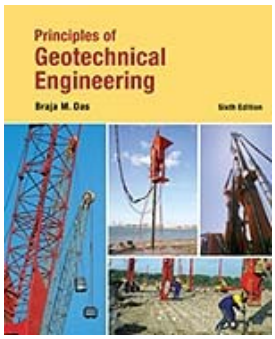
Laboratory

Monday, Wednesday or Friday
at 2:30 to 4:30 PM (E2-2345)

Text Book

Principles of Geotechnical Engineering 6th Edition. Thomson Braja Das 2006

- Cost $126.95 @ Bookstore



Notes

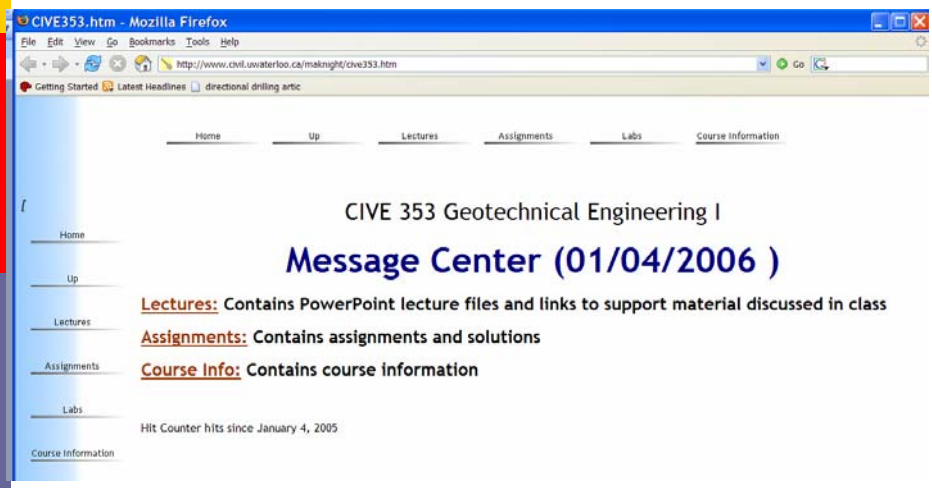
CIVE 353 Laboratory Manual

- Available at the course website
- www.civil.uwaterloo.ca/maknight/cive353.htm

- Lecture notes will be available on the course website before class

Course website

http://www.civil.uwaterloo.ca/maknight/cive353.htm



Laboratory Sessions

- Attendance is compulsory
- Five lab sessions:
  - permeability
  - direct shear
  - consolidation
  - compaction
  - triaxial

Laboratory Sessions

- Class divided into groups for lab sessions:
  - Students can set own groups:
  - Give names in writing (e-mail) to Ken Bowman by Thursday January 5th
- Each group is required to submit a lab report
  - Report requirements given in Lab Manual

Laboratory Schedule

- Lab groups & schedule will be posted in room E2-2345 on Monday Jan 9th
- To ensure that you are prepared for each lab session a short quiz will be given at the beginning of each lab session.
- Quizzes will be evaluated and worth 5 term marks.
- Lab reports will be evaluated and worth 10 term marks

Assignments

- All assignments will be posted on the course website
- Solutions will be posted on course website after submission date.
- One random question from each Assignment will be graded
- Assignment questions are to be asked in the tutorial periods

Term Quizzes

- Two 50 minute term quizzes:
  - Week of January 23
  - Week of February 20

Tutorials

- Provide help with assignments and labs
- Some tutorial periods will be lectures

Marking Scheme

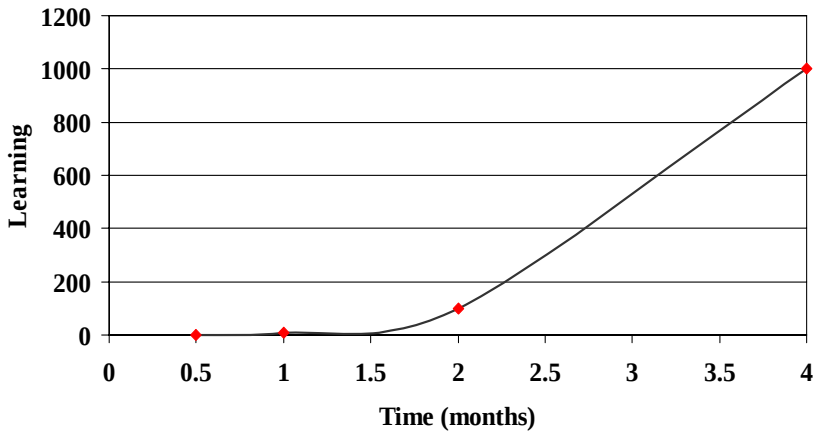
The term grade will be determined using:

Assignments	5%
Lab quizzes	5%
Term quizzes (10% each)	20%
Lab Reports	10%
Final Exam	60%

Course Conditions

- Attendance at all assigned laboratory sessions
- For course credit all assigned work must be completed and submitted for grading
- Passing grade on the final exam (50%)

Learning Curve



Final Course Grade

Option A

Final exam Score is less than 50%

- Final exam mark will be recorded as the final course grade

Option B

Final exam score is greater than course mark

- Exam score will be recorded as the final course grade

Course Objectives

- Introduce the fundamentals of soil mechanics
- Provide the foundation for subsequent geotechnical design courses

  (CIVE 354 and CIVE 554)
  - shallow and deep foundations, slope stability, retaining walls, open braced excavations, etc.

Course Outline

- Review of geologic processes
- Basic geotechnical test methods
- Soil structure and classification
- Subsurface exploration techniques
- Weight-volume relations
- Soil compaction
- Water flow through soil
- Total and effective stress
- Stresses in a soil mass
- Soil compressibility
- Shear strength

What is Geotechnical Engineering?

- Civil engineering structures are constructed on or within the earth surface
  - Bridges, tunnels, highways, buildings, etc.
- Earth materials are often used as construction materials
  - Earth dams, highways, landfills, etc.

Geotechnical Engineer

Slope Engineering

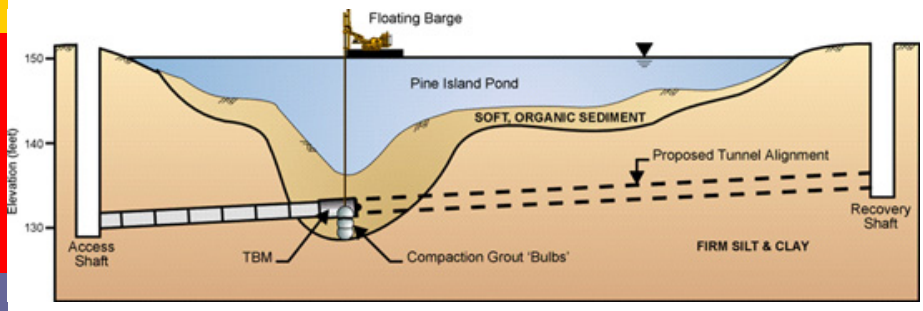
Tunnel Boring Machine

World largest tunneling machine

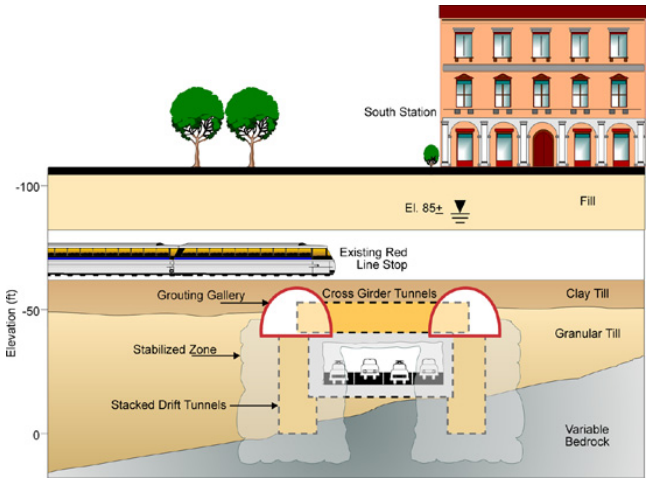
(14.2 m in diameter)

Chunnel

Tunneling



Subways



Billion $ Coal Fire Power Station Belledune, New Brunswick

Earth Dams

Geotechnical Engineering

- Important that we understand the mechanical behaviour of natural materials
  - In situ (natural) state
    - Load capacity & settlement
  - As construction material
    - Compaction, durability, performance
      - Permeability, strength, compaction

Soil and Rock Mechanics

- Rock mechanics:
  - Mechanical behaviour of consolidated materials
    - Mineral aggregate strongly bonded
      - Sandstone, granite, limestone, fractured rock, etc.
- Soil mechanics:
  - Mechanical behaviour of unconsolidated materials
    - Mineral aggregate loosely held together
      - Sand, gravel, clay, till, peat etc.