MNGN 321 Introduction to Rock Mechanics
Effective teaching of a highly theoretical yet significantly empirical course

BACKGROUND

Rock mechanics discipline crosses a wide variety of earth engineering subjects that may involve breaking or preserving rocks in situ or in laboratory. It is a relatively new engineering discipline and has always been taught as a core course at CSM. As being the case in many other engineering disciplines, the teaching of rock mechanics has evolved over time to follow the developing technological and pedagogical developments in the related fields. The rate in these changes significantly increased over the last decade following the increased interest in larger mining operations and new energy development processes such as hydrofracturing and geothermal energy. The main objective of this course revision effort is to develop and apply the appropriate pedagogical approaches that allows increased course content and teaching effectiveness without increasing the time allocated for the course. The illustrations in the next column show the underlying concepts adopted for the course revision.

WHAT IS CHANGING

Develop tools for student feed backs Feed back from from students from evaluations

INTENDED OUTCOMES

Revised Course Learning Outcomes
- Use the concepts of stress, strain, and elasticity to describe the response of intact rock to loading
- Use Mohr-Coulomb and Hoek-Brown failure criteria to evaluate rock strength under compressive, tensile, and shear loading conditions
- Analyze the mechanical response of rocks to excavations developed underground or surface
- Design rock excavations on surface and underground sites using empirically based classification systems and numerical modelling approaches
- Design mine pillars using empirical and numerical modelling approaches
- Develop support system designs for stabilizing excavation walls
- Develop abilities to perform o laboratory tests on rocks for determining properties of intact rocks o In situ measurements for determining physical properties of rock masses o numerical modelling exercises for simple excavation design experiments

Examples of Assessments
Formative: Reading assignment: before class, example solutions to material covered during class
Summative: Midterm exam, Final exams, homework problems, lab reports.

From Learner to Teacher

‘Professor continuously lecturing in a class for 50 minutes is not that effective”

“Start the class by giving a short (ten minutes or less) overview toward building up (a sense of) an understanding of the subject being taught that day”

“Include in class one or two short group assignments (exercise, problem, discussion, web search) - students can ask questions if they need to”

“What works better is instructor explains the core concepts, then students build on it using the given material, internet, and the instructor available to them”

:Reading assignments before coming to class and follow up in class or with quiz”

“Provide students hands on experiences”

Ugur Ozbay, Professor, Mining Engineering Department
Rock mechanics analysis and design for surface and underground mines

Summer 2017 Cohort