Department: Mining Engineering   **Division:** Tunneling and Underground Spaces

Level and Major: MSc, Tunneling and Underground Spaces

Course Title: Principles of Design and Analysis of Underground Openings

Number of Credits: 3   **Lecturer:** Dr. Kourosh Shahriar

Course Goals and Objectives

Acquiring the skills needed to design underground spaces in different geological conditions with different goals.

Course Topics

- Overviews, definitions, words and concepts in underground excavations
- The Role of Geology in Underground Excavations including Stratigraphy, Geology and new tectonics, Geology, and Geothermal Water
- Engineering geological studies for the design of underground spaces including surface and subsurface excavations, in situ geotechnical and laboratory experiments, instrumentation and behavior
- Determining the in situ stresses in the land by the tectonic investigation, elasticity calculations, and direct measurement
- Determining the distribution of stresses after digging the underground spaces with different shapes in single, even and multiple forms
- Methods of land recovery and stabilization including drainage and drying, injection of grout, frost, pipe and wire harness installation, net installation and spraying
- Digging underground spaces in the soft ground by traditional and mechanized methods
- Support the underground spaces in rigid and rocky grounds by traditional and mechanized methods
- Executive quality assessment of underground drilling machines
- Design of support the underground spaces in rigid and rocky grounds by experimental methods including RMR, RMP, and Q, computational methods such as Retaining rock interaction, observation, and operation including the new Austrian method, and numerical analysis with methods such as finite element and boundary integral equations
- Investigation of structural control ruptures in jointed and stratified rocks and design of support the potentially unstable parts

- Investigation of the effect of dynamic loads and stresses resulting from firing and earthquake on the stability of underground spaces.

Reading Resources

- Up-to-date articles