NATIONAL UNIVERSITY OF ENGINEERING

COLLEGE OF GEOLOGICAL, MINING AND METALLURGICAL ENGINEERING

GEOLOGICAL ENGINEERING PROGRAM

GE823 – GEOMECHANICS

I. GENERAL INFORMATION

CODE	: GE823 Geomechanics
SEMESTER	: 8
CREDITS	: 4
HOURS PER WEEK	: 5 (Theory - Practice - Laboratory)
PREREQUISITES	: GE102 Field Geology, GE511 Structural Geology
CONDITION	: Mandatory

II. INTRODUCTION

The course prepares students in the characterization and analysis of soil and rocks, as well as their mechanical behavior, to be applied in underground and surface mining, and petroleum exploration and exploitation, tunnel design, rock breakage and rock drilling. Geomechanics methods are used for formulating soil and rock models for predicting important rock parameters, such as in-situ rock stresses, modulus of elasticity, leak-off coefficient and Poisson's ratio. In petroleum reservoir analysis, parameters such as formation porosity, permeability and bottom hole pressure can be derived from geomechanical evaluation.

III. COURSE OUTCOMES

At the end of the course, students:

1. Organizes surface and underground research
2. Explains the Geomechanics concepts and methods.
3. Understands the definition and scope of underground operation methods
4. Interprets geomechanical applications in surface exploitation.
5. Understand the meaning of sustainability and control of rocky massif in underground work.
6. Analyze the stability of slopes and its control in surface operations.

IV. LEARNING UNITS

1. INTRODUCTION TO GEO MECHANICS

Preliminary definition / General objectives (2 Weeks) / Principles of rock mechanics and soil mechanics / Achievements of the Department of Geomechanics / Geometric classification and its applications / Influence of geology / Influences of constructive processes / Determination of G.S.I. (Geological Strength Index).

2. SURFACE AND UNDERGROUND RESEARCH

Field research / Instrumentation and control / Investigation of Geomechanical research programs.

3. MINING EXPLOITATION AND RELATED WORKS

Definition of underground exploitation method / Definition of the methods of exploitation Superficial./ Installations and complementary works in mining exploitation / Geomechanical applications in underground exploitation / Design stages / Excavation stages / Stages of filling.

4. GEOMECHANICAL APPLICATIONS IN SURFACE EXPLOITATION

Design stage / Excavation stage / Closing stage / Geomechanical applications in physical safety of complementary works / Stage of construction / Stages of operation.

5. SUSTAINABILITY AND CONTROL OF ROCKY SOIL IN UNDERGROUND WORK

Use of anchor bolts and complementary elements / Use of launched concrete and complementary elements / Use of the metallic false-work and complementary elements. Uses of wooden elements and complementary elements.

6. SUSTAINABILITY AND CONTROL OF STABILITY OF SLOPES IN SURFACE WORKS

Support placement procedure.

V. LABORATORY AND PRACTICAL EXPERIENCES

In the course, students 4 laboratory experiences.

VI. METHODOLOGY

The course is taught in classroom mode consisting of sessions of theory, practice and computer simulation. In theory sessions, the teacher presents concepts, theorems and applications. In practice sessions, various problems are solved and their solution is analyzed. At the end of the course, students must submit and defend a project on geomechanics applied to underground mining, surface mining, petroleum exploration, tunnel design, rock breakage or rock drilling. In all sessions, active participation of students is promoted

VII. GRADING FORMULA

Evaluating System: “G”. The Final Grade PF is calculated as follows:

PF= (EP + EF + PP) / 3

EP: Mid-term Exam EF: Final Exam PP: Average of practical work

VIII. BIBLIOGRAPHY

1. Mark D. Zoback.
Reservoir Geomechanics, 2016

2. John W. Bull
Numerical Analysis and Modeling in Geomechanics
CRC Press., 2016