# NATIONAL UNIVERSITY OF ENGINEERING
# COLLEGE OF GEOLOGICAL, MINING AND METALLURGICAL ENGINEERING
## METALLURGICAL ENGINEERING PROGRAM

---

# MI233 – MINING SAFETY AND HYGIENE

## I. GENERAL INFORMATION

| | | |
|---|---|---|
| **CODE** | **:** | MI233 Mining Safety and Hygiene |
| **SEMESTER** | **:** | 9-10 |
| **CREDITS** | **:** | 4 |
| **HOURS PER WEEK** | **:** | 6 (Theory – Practice) |
| **PREREQUISITES** | **:** | ME431 Administration |
| **CONDITION** | **:** | Elective |

## II. COURSE DESCRIPTION

This course is designed to allow students develop a solid preventive culture, complementing the knowledge already acquired in the career with tools that facilitate the exercise an effective and efficient control of the constant risks in every mining process, revealing the importance of labor risks preventions during the development of a work and its close ties with the concepts of quality and productivity.

## III. COURSE OUTCOMES

At the end of the course students:

1. Interpret and apply national technical regulations and rules regarding current labor risks prevention in the mining and construction sector.
2. Learn main labor risk factors in mining and construction works.
3. Work out risk analysis: identify dangers; assess risks and operational control mechanisms.
4. Design, implement, manage and assess labor risks prevention plans in mining and construction works.
5. Research work accidents: assess consequences, identify causes and establish corrective actions.
6. Identify, assess and control the most frequent significant environmental aspects in mining works.

## IV. LEARNING UNITS

### 1. RISK FACTORS AND REGULATION FRAMEWORK

Safety and health conditions in construction works in Peru. Risk factors in construction works. Work accidents, causes and consequences. National technical regulations and rules regarding to safety and health, applicable to mining works. Individual protection equipment (IPE) and collective protection systems (CPS). Technical specifications. Technical-economic assessment. IPE / CPS selection. Signs. National and international rules.

### 2. OPERATIONAL RISKS IN MINING AND CONSTRUCTION WORKS

Safety in mining and construction works. Risks generated from the use of manual machines and tools. Risks generated from the operation and use of materials. Risks generated from the use of electricity. Risks in specific activities: demolitions, excavations, land movement (heavy equipment), formwork, removal of formwork. Concrete placement and production. Steel placement and preparation. Metal working jobs (electric, oxyacetylene and compressed gas cylinder welding), working in confined spaces, mechanical lifting of loads.

Industrial hygiene in construction works. Concepts. Chemical agent, explosion control, use of dangerous chemical products. Physical agents, noise, vibrations and radiations.

**3. OPERATIONAL RISKS MANAGEMENT IN MINING AND CONSTRUCTION WORKS**

Risk analysis. Identification of dangers, risk assessment, operational control mechanisms. Elaboration of standards and work procedures. Management of non-conformities. Verification mechanisms, identification, assessment and register of non-conformities. Establishment of corrective action, work accident investigation. Determination of causes (analysis methods), mitigation and corrective actions. Work accident statistics. Performance indicators analysis and formulation of line actions for continuous improvement.
Response planes in emergencies: design, implementation, testing (Drills) and adjustment.

**4. DEVELOPMENT OF PREVENTIVE BEHAVIOR IN WORKERS, RISKS PREVENTION PLAN**

Behavior change fundamentals. REAZON – WILLPOWER, key binomial. Training as tools to achieve the preventive behavior in the worker. Communication techniques. How to design an effective training program in keeping with the work? Work head leadership. Command line responsibilities (engineers and foremen). Safety committee as key element of an intrinsically safe production process. System concept for the design, implementation, management and assessment of the risks prevention plan in mining and construction works.

## V. LABORATORY EXPERIENCES

**Visit to metallurgical plant 1:** Identification of risks.
**Visit to metallurgical plant 2:** Safety plan assessment.
**Visit to metallurgical plant 3:** Control and management system assessment.

## VI. METHODOLOGY

Expository-Interactive method: instructor lecture, student exposition. Guided discussion method: managing of the group to approach situations and come to conclusions and recommendations. Demonstration method: Execution. The instructor executes to show how and what it has to be done with, and the students execute it to prove they have learned.

## VII. EVALUATION FORMULA

The average grade PF is calculated as follows:

**PF = (EP+EF+((P1+P2+P3+P4+P5+P6)/5)/3**

EP: Mid-Term Exam EF: Final Exam
P#: Quizzes

## VIII. BIBLIOGRAPHY


1. **ALEJANDRO MENDOZA PLAZA**
   Implementing the Business Preventive Culture. Achieve Zero Accidents. AMeP and Safe-Pro Method (Spanish)
   Confemental Foundation, 2004
2. **OSHA 2202 PUBLICATION**
   Construction Industry Digest
   Revised in 2002, 105 pp
3. **CESAR MINGUES FERNANDEZ**
   Prevention planning and execution, Risk Assessment in Constructions (Spanish)
   Escuela de la Edificación Foundation, 3rd Edition, 2001
4. **Ed. CEP**
   Labor Risks Prevention Handbook, Construction sector and related matters (Spanish)
   CEP Editorial, 2010

## IX. COURSE CONTRIBUTIONS TO STUDENT OUTCOMES ATTAINMENT

Course contributions to Student Outcomes are shown in the following table:

Level 1: Know
Level 2: Comprehend, calculate
Level 3: Model, apply, solve
Level 4: Apply at advanced level, design. Achievement of Student Outcome

| Outcome | Contribution |
|---|---|
| **1. Engineering Design**<br>Design and integrate metallurgical systems and components satisfying requirements and needs as well as given technical, economic, social and legal constraints and limitations. | |
| **2. Problem solving**<br>Identify, formulate and solve engineering problems properly using the methods, techniques and tools of metallurgical engineering. | 3 |
| **3. Sciences Application**<br>Apply the knowledge and skills of mathematics, sciences and engineering to solve metallurgical engineering problems. | 3 |
| **4. Experimentation and Testing**<br>Conceive and conduct experiments and tests, analyze data and interpret results. | |
| **5. Modern Engineering Practice**<br>Use and apply techniques, methods and tools of modern engineering necessary for the practice of metallurgical engineering. | 4 |
| **6. Engineering Impact**<br>Understand the impact of metallurgical engineering solutions on people and society in local and global contexts. | 4 |
| **7. Project Management**<br>Determine the budgets, schedules and feasibility of engineering projects, and participate in its management for the attainment of goals. | 4 |
| **8. Environmental Appraisal**<br>Take into account the importance of preserving and improving the environment in the development of their personal and professional activities. | 4 |
| **9. Lifelong Learning**<br>Recognize the need to keep their knowledge and skills up-to-date according to advances of metallurgical engineering and engage in lifelong learning. | 4 |
| **10. Contemporary Issues**<br>Know and analyze relevant contemporary issues in local, national and global contexts. | 4 |
| **11. Ethics and Professional Responsibility**<br>Evaluate their decisions and actions from a moral perspective and assume responsibility for the executed projects. | 4 |
| **12. Communication**<br>Communicate clearly and effectively in oral, written and graphical formats, interacting with different types of audiences. | 4 |
| **13. Teamworking**<br>Appraise the importance of teamworking and participate actively and effectively in multidisciplinary teams. | 4 |