



NATIONAL UNIVERSITY OF ENGINEERING

COLLEGE OF ENVIRONMENTAL ENGINEERING

HYGIENE AND INDUSTRIAL SAFETY ENGINEERING PROGRAM

SE101 – SAFETY ENGINEERING I

I. GENERAL INFORMATION

CODE	: SE101 – Safety Engineering I
SEMESTER	: 5
CREDITS	: 04
HOURS PER WEEK	: 06 (Theory – Practice)
PREREQUISITES	: Safety Psychology
CONDITION	: Mandatory

II. COURSE DESCRIPTION

The course prepares the students in the application of the concepts, methods and techniques for the evaluation and control of work accidents risk in all economic sectors. Identification of hazards as study elements of all production processes from the global framework of Occupational Health and Safety, and risk assessment as a methodology to prioritize those elements that have the potential to occur and generate accidents in the workplace. Emphasis is placed on the concepts of Productivity in the Company, Work Study, Basic Concepts of LEAN, Tools, Human Factor, Prevention through Design (PTD). The accident, types, conditions and unsafe / substandard acts, differences, key factors, Models of Causation, Investigation of Accidents according to Peruvian and American standards, Inspections, safety analysis at work, accident records, frequency indexes, severity and others , accident costs, Training, Training and motivation, Organization and Management of security programs.

III. COURSE OUTCOMES

At the end of the course the student will:

- Identify the flows of productive processes to incorporate productivity tools through the prevention of risks from design.
- Identify the hazards and evaluate the risks of the different industrial processes or other work areas from the productivity approach.
- Define the hazard control strategy and minimize the risks.
- Understand concepts and principles of risk analysis: assessment, management and communication of risks in the prevention of accidents and incidents
- Train in the management of risk control methodologies for accidents at work.
- Propose control methods based on the hierarchy of controls in aspects of industrial safety and hygiene.
- Prepare clear technical reports detailing the process developed, interpreting results and formulating conclusions and recommendations.

IV. LEARNING UNITS

1. Introduction

Basic Concepts, Security in Design, Trends in SST. Historical Overview of Industrial Safety. Human Security. Systems Theory in Engineering. Concept of value chain applied to security.

2. Productivity Relationship and the prevention of occupational risks

Productivity in the Company, Work Study. LEAN Manufacturing concept. SCORE Methodology - ILO. SOLVE Methodology - ILO

3. The human factor in the application of the study of work.

Definition of Risks Risk factors. Definition of Accident. Legal and technical concept. Accident Chain Unsafe / Substandard Conditions and Acts. Models of occurrence of accidents.

4. Accidents / Incidents

Investigation in Security. Key Factors for accidents. Key Factors Identification. Ansi standards z16.1 and Ansi z16.2. OSHA Safety Observation Guides. Usefulness of the records. Accidents Reports. Preparation of Record Formats. Accident statistics. Study of different cases.

5. Proactive and Reagent Indices

Frequency Indexes. Gravity indices. Accident Record Systems. Presentation of statistics at the Company scale. Formulation of the cost of an Accident. Its structure. The relationship with insurance. Importance of reporting costs. How to present costs before management.

6. Tools to reduce the probability of occurrence of hazards and the severity of the damage.

Security Analysis: AST, Procedures and Instructions. Inspections: The labor inspection. Inspection Techniques Classification of dangerous places. Elaboration of Formats for inspections. The human resource in security. Development of a Training and Training program. NLP, Coaching applied to Security Engineering. Preparation of a basic course in security. Teaching methods. Techniques Motivation and active interest in Safety.

7. Technical Inspections of Building Safety. Methodology and procedures.

Rules. Type of standards. National Building Regulations. Structure and relationship with design safety. Technical Standards in Security.

8. Planning a Risk Prevention Program in Health and Safety at Work

Definition of Program objectives. Basic elements of the Security Organization. How to structure a Security Program at company level. Presentation of a methodology. Evaluation of a Security Program: Program Costs. Budgets and Financing. Evaluation methods. The relationship with Lean manufacturing.

V. LABORATORIES AND PRACTICAL EXPERIENCES

Each Learning Unit requires cabinet and field practices to reinforce the theoretical concepts. Likewise, practical cases will be studied within the University.

VI. METHODOLOGY

The course develops in theory sessions and cabinet practices. In the theory sessions, the professor presents the concepts and in the practical sessions, their integral understanding is promoted with the use of risk assessment methodologies. In practice sessions, cases will be used to deepen the theoretical concepts.

At the end of the course the student must prepare and present an applied project / work of some topic that have been addressed in the course. In all the sessions, the active participation of the student is promoted.

VII. EVALUATION FORMULA

The learning will be evaluated through the "C" system.

- Partial Exam: Weight 1
- Final Exam: Weight 2
- Practices Average: Weight 1.

Calculation of the Final Average:

$$FA = \frac{PE + 2 * FE + PA}{4}$$

PE: Partial Exam; FE: Final Exam, PA: Practices Average

For the Practices Average, during the semester five qualified practices and one project (PI) are graded, the practice with lowest grades is eliminated and the average is calculated with the remaining four practices and the project.

$$PA = \frac{P1 + P2 + P3 + P4 + PI}{5}$$

VIII. BIBLIOGRAPHY

- International Labor Office (ILO). Introduction to work study. ILO. Geneva, 4th Edition revised. 2010
- International Labor Office (ILO), Encyclopedia of Occupational Health and Safety, Electronic edition corresponding to the third edition of the Encyclopedia, with the collaboration of the ILO and the Ministry of Labor and Social Affairs, Spain, 1999.
- SCORE Methodology - ILO. 2014. www.scoreperu.org
- Law No. 29783. Safety and Health at Work - 2011
- DS-005-2012-TR. Occupational Health and Safety Regulations - 2012
- National Building Regulations - 2006 Edition and updates. A.010 - A.130
- NTP 350.021: 2004. Classification of Fires and their Graphic Representation
- NTP 350.043-1 Peruvian Technical Standard. Portable fire extinguishers. Selection, Distribution, inspection, maintenance, recharge and hydrostatic testing.
- NTP 399.010 Peruvian Technical Standard. Safety signs. Colors. Symbols Forms and dimensions of safety signs. Part 1: Rules for the design of safety signs