



NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ENVIRONMENTAL ENGINEERING
HYGIENE AND INDUSTRIAL SAFETY ENGINEERING PROGRAM

HO310 – WORK ERGONOMIC DESIGN

I. GENERAL INFORMATION

CODE	: HO310 – Ergonomic Work Design
SEMESTER	: 9
CREDITS	: 03
HOURS PER WEEK	: 05 (Theory – Practice)
PREREQUISITES	: SA654 – Ergonomics
CONDITION	: Mandatory

II. COURSE DESCRIPTION

The course prepares the student to design work systems taking into account the human, technical and organizational factors in order to contribute to the workers safety and health and achieve greater performance and productivity. At the end of the course, the student applies concepts, principles and methods to develop solution proposals adapted to the context of the organization, developing skills such as teamwork, professional ethics and engineering and humanistic criteria.

III. COURSE OUTCOMES

At the end of the course the student will:

- Analyze the work situations that are source of difficulties demonstrating fundamental aspects of Ergonomics and other disciplines.
- Create and develop proposals for socio-technical solutions to the problems encountered related to working conditions taking into account the standards and regulations.
- Involve the worker and other actors in the solution proposals.

IV. LEARNING UNITS

1. Microergonomics and Macroergonomics

Man-machine interface / Man - Technology - Organizational structure - Internal environment
- External environment / Technology transfer (Human, organizational and technical factor)

2. Anthropometry applied to work

Definition / Classification / Anthropometric variables / Measuring instruments / Statistical treatment / Applications in the workplace

3. Physical work load

Muscle work / Evaluation of energy consumption

4. Mental work load

Definitions / Explanatory models / Consequences / Techniques and instruments

5. Ergonomic criteria in the design of jobs

For whom to design / Determination of the main working position / Work plans / Work areas and volumes / Layout / Regulations and competent procedures

6. Stages of an intervention in ergonomics

Analysis of the demand / Understanding of the operation of the company / Analysis of work situations / Proposals and specifications / Implementation and accompaniment / Strategies of intervention

7. Simulation and prototyping

Identification of problems and needs / Reference work situations / Specifications in the Design / Prototype supports / Validation / Cost-Benefit

8. Design and development of products

Types of products / Designer's intervention / Context of use / Characteristics of the products / Usability

9. Ergonomics and accessibility

Type of disability / Adaptation of jobs according to the type of disability

V. LABORATORIES AND PRACTICAL EXPERIENCES

- Laboratory 1: Anthropometry at work
- Laboratory 2: Physical workload
- Laboratory 3: Mental workload
- Laboratory 4: Jobs Design Part I
- Laboratory 5: Jobs Design Part 2
- Laboratory 6: Design thinking (Empathy / define / devise / Prototype / Evaluate)

VI. METHODOLOGY

The course is carried out through classes, providing a series of tools for the design of work systems, with the aim of developing and implementing solutions according to the problems found in the work organizations. In addition, dynamic workshops will be held to promote active participation, through the study of different cases in order to be understood and resolved. At the end of the course the student must prepare and present an integrating project or work seeking the solution of a problem related to the course.

VII. EVALUATION FORMULA

The learning will be evaluated through the "G" 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 four qualified practices and the practice with lowest grades is eliminated. The average is calculated with the remaining three practices.

$$PA = \frac{P1 + P2 + P3}{3}$$

VIII. BIBLIOGRAPHY

- St-Vincent, M., Vézina, N., Bellemare, M., Denis D., Leoux, É. & Imbeau, D. (2001). Ergonomic intervention. IRSST. Canada
- Mondelo P. R., Gregori, E., Blaso, J. & Barrau, P. (1999) Ergonomía 3. Diseño de puestos de trabajo. Mutua Universal. Spain.
- Karl T. Ulrich, Steven D. (2009). Diseño y desarrollo de productos. Edición Ma Graw Hill. 4th Edition.
- Karwoski W. & S. Marras W. (2013). Occupational Ergonomics: Design and Management of Work Systems (Principles and Applications in Engineering). CRC Press. USA