PROFESSIONS IN SCIENCE AND TECHNOLOGY

Semester II

Content

Introduction

Objective:

To make the student discover, in a first stage, all the sectors that are covered by the Field of Sciences and Technologies and in a second stage a panoply of the professions to which these sectors lead. In the same context, this subject introduces the student to the new challenges of sustainable development as well as the new professions that can result.

CHAPTER 1

INDUSTRIAL HYGIENE & SAFETY (IHS) AND MINING ENGINEERING

الصحة والسلامة الصناعية وهندسة التعدين

Industrial Hygiene & Safety and Environment

I. **Definition and different axes of the HSE sector**
II. **Sectors of activity**
III. **Role of Specialist and HSE Specialist Training**

Hygiene, Safety and Environment (HSE)

- Hygiene or Health, Safety and Environment (HSE) is a field of expertise that encompasses and covers all aspects of health and safety in the workplace.
- It is an area of technical expertise controlling the aspects related to professional risks within the company. As such, the HSE Officer is responsible for:
  - ensuring the safety of personnel ضمان سلامة الموظفين
  - Prevention training لتدريبها في مجال الوقاية
  - compliance with standards الامتثال للمعايير
  - and the reliability of the company's installations وموثوقية التركيبات في الشركة
  - implementing the measures in the company. .وتنفيذ التدابير في الشركة

Job (profession) description

- The HSE manager is a risk manager because the prevention of breakdowns and personal injury has become a considerable issue for companies and insurance companies (see the disasters of Chernobyl, Seveso, AZF, asbestos disasters...)
- The health and safety function ensures the proper functioning of the company by reducing human and material damage. It takes priority:
  - industrial accidents الحوادث الصناعية
  - occupational illnesses الامراض المهنية
  - and environmental protection. حماية البيئة
- This job requires good physical resistance and endurance, composure, initiative, and observation تتطلب هذه الوظيفة مقاومة بدنية جيدة وتحمل ومبادرة وملاحظة

Opportunities

Hygiene and safety professionals work in:

- engineering offices, المكاتب الهندسية
- control organizations, منظمات التحكم
- local and territorial authorities, السلطات المحلية والإقليمية
- insurance, شركات التأمين
- fire departments and rescue services, فرق الإطفاء
- classified installations. .المنشآت المصنفة

Health, safety and environment manager

The health, safety and environment (HSE) manager is the man of all preventive measures. He or she is responsible for preventing industrial risks, ensuring compliance with health and working conditions, and helping to produce without polluting.

Whether in a public company (hospital center, classified facilities service, local authority...) or private (chemical industry, metallurgy, automotive, construction , etc...), **the hygiene, safety and environment manager:**

- advises and assists management in the development and organization of its security policy (workplace safety, working conditions). يقدم المساعدة للإدارة في تطوير وتنظيم سياستها الأمنية (السلامة في مكان العمل)
- ensures implementation, facilitation, and monitoring, يضمن التنفيذ والتسيير والرصد
- establishes prevention programs to reduce the number of incidents and their cost (work accidents, occupational diseases). يضع برامج وقائية لتقليل عدد الحوادث وتكاليفها(حوادث العمل,الامراض المهنية)
- directs and controls any preventive action against risks and nuisances.يوجه ويراقب أي اجراء وقائي ضد المخاطر والمضايقات

carry out
action plans

consult, train,
inform

analyze
situations,
evaluate risks

accompany,
follow progress
improve

investigate,
discuss, observe,
understand

search for suitable
solutions

Occupational risk المخاطر المهنية

The employee and his company: الموظف وشركته

The company implements all the conditions that allow for the physical and mental integrity of employees to be respected and the consequences of a work accident or occupational disease to be limited. The prevention approach is a factor in the personal and professional development of the company's employees and a guarantee of quality in social dialogue

The main risks

There are various types of risks related to the professional environment:

- **Work accident:** which is defined by the fact that the employee is under the responsibility of his employer, and the commuting accident when it occurs between the employee's home and his workplace (or between his workplace and the place where he has his meal).حوادث العمل
- **Occupational disease:** is the consequence of more or less prolonged exposure to a physical, biological, or chemical risk (dust, toxic fumes, noise, heat, vibrations) that exists during the usual practice of the profession.الأمراض المهنية
- **Psychosocial risks**: Typical psychosocial hazards in the workplace include: bullying. conflicting demands and lack of role clarity. lack of control over the way work is done and/or the work rate.المخاطر النفسية والاجتماعية

The cost of the HSE policy. تكلفة سياسة الصحة والسلامة والبيئة

- Mainly includes the contributions that the company pays to the Retirement and Occupational Health Insurance Fund and the cost of protective equipment. These contributions vary according to its size and facilities, so they will range from 1 to 10% of the payroll. The main mission of the insurance fund is to collect employee and employer contributions intended to finance the general social security system, as well as other organizations or institutions.

1. Retirement Contributions: اشتراكات التقاعد

- Companies are obliged to contribute a percentage of their employees' salaries to the Retirement Fund. This contribution is vital for securing employees' financial well-being post-retirement.
- The specific percentage may vary based on regulatory requirements and the company's size

2. Occupational Health Insurance Contributions: اشتراكات التأمين الصحي المهني

- Contributions to the Occupational Health Insurance Fund are essential to provide coverage for work-related health issues and ensure employees have access to medical services.
- The contribution rate is often calculated as a percentage of the payroll and may vary depending on the size and industry of the company.

3. Protective Equipment Costs: تكاليف معدات الحماية
   - Companies are responsible for providing necessary protective equipment to ensure the safety and well-being of employees in the workplace.
   - Costs associated with purchasing, maintaining, and periodically replacing protective gear are essential for compliance with occupational health and safety standards.
4. Social Security System Financing: تمويل نظام الضمان الاجتماعي
   - The primary mission of the insurance fund is to collect contributions from both employees and employers to finance the general social security system.
   - These funds contribute to supporting various social security benefits, such as retirement pensions, health coverage, and other welfare programs.
5. Regulatory Compliance: الامتثال التنظيمي
   - Companies must adhere to legal requirements regarding contributions to the Retirement and Occupational Health Insurance Fund. Failure to comply may result in legal consequences and financial penalties.
6. Varied Contribution Rates: معدلات الاشتراكات المتنوعة
   - The flexibility of contribution rates, ranging from 1% to 10%, accommodates differences in company size and financial capacity.
   - Larger companies with greater resources may contribute at the higher end of the spectrum, reflecting a proportional commitment to employee welfare.
7. Employee and Employer Partnership: شراكة الموظفين وأرباب العمل
   - Both employees and employers play a pivotal role in sustaining the social security system through their respective contributions. This partnership ensures the availability of financial resources for the collective well-being of the workforce.

The legal tools. الأدوات القانونية

Health, Safety, and Environment (HSE) management relies on a set of legal tools to establish and enforce measures ensuring the well-being of individuals and the protection of the environment. These tools encompass regulations, standards, and enforcement mechanisms.

- **Regulations: :اللوائح**
- **Occupational Health and Safety Regulations:** These are government-imposed rules that mandate specific conditions and practices to maintain a safe working environment. These regulations cover a spectrum of factors such as machinery safety, workplace ergonomics, and employee training to prevent workplace accidents.لوائح الصحة والسلامة المهنيتين
- **Environmental Regulations:** Governments enact regulations to control and mitigate the impact of industrial activities on the environment. These regulations address issues such as air and water quality, waste management, and the responsible use of natural resources. الأنظمة البيئية
- **Hazardous Materials Regulations:** Focused on the handling, transportation, and disposal of hazardous materials, these regulations aim to prevent accidents, spills, and contamination. Compliance is crucial to safeguard both human health and the environment.لوائح المواد الخطرة

- **Standards: المعايير**
  - **Occupational Health and Safety Standards:** Voluntary guidelines established by organizations like ISO provide a framework for implementing effective health and safety management systems. These standards serve as benchmarks for organizations seeking to enhance workplace safety beyond basic regulatory requirements. معايير الصحة والسلامة المهنيتين
  - **Environmental Management Standards:** Standards such as ISO 14001 offer a systematic approach to managing environmental responsibilities within an organization. Adherence to these standards helps organizations demonstrate a commitment to sustainable practices and environmental stewardship. معايير الإدارة البيئية
- **Enforcement Mechanisms: آليات الإنفاذ**
  - **Inspections and Audits:** Regulatory bodies conduct regular inspections and audits to assess compliance with HSE regulations. These processes identify areas of non-compliance and ensure that corrective actions are taken promptly. عمليات التفتيش والمراجعة
  - **Penalties and Fines:** Legal frameworks empower authorities to impose penalties and fines on organizations found to be in violation of HSE regulations. The severity of penalties may vary based on the nature and extent of the breach. العقوبات والغرامات
  - **Litigation:** Individuals or entities affected by HSE violations may pursue legal action to seek compensation for damages. Litigation serves as a mechanism for holding responsible parties accountable for any harm caused due to non-compliance with HSE regulations. التقاضي

Mining Engineering

Mining Engineering

The field of mining engineering is essential for the exploration, extraction, and processing of valuable minerals from the Earth's crust. This abstract provides an overview of key aspects of mining engineering, including geological exploration, mine design and planning, rock mechanics, mineral processing, environmental management, and mine safety. Geological exploration involves locating mineral deposits through various techniques such as geological mapping and drilling. Mine design and planning encompass determining optimal extraction methods and designing mine layouts and infrastructure.

Rock mechanics focuses on ensuring the stability of underground excavations. Mineral processing involves extracting valuable minerals from ore through physical and chemical processes. Environmental management aims to mitigate the environmental impacts of mining activities, while mine safety ensures the well-being of workers and compliance with regulations. Overall, mining engineering plays a vital role in meeting global mineral demands while addressing economic, environmental, and safety concerns.

Definition of Mining engineering

- **Mining engineering is** a specialized field of engineering that encompasses the discovery, extraction, processing, and utilization of mineral resources from the Earth's crust. It involves the application of scientific and engineering principles to efficiently and safely extract valuable minerals while minimizing environmental impact and maximizing economic benefits.

- **Mining engineers are** responsible for various aspects of mining operations, including **exploration**, **mine design**, **planning**, **construction, operation, and reclamation**. They employ a multidisciplinary approach, integrating knowledge from geology, geotechnical engineering, mineral processing, environmental science, and management to ensure the sustainable and responsible development of mineral resources.

Mining engineering training

التدريب في مجال هندسة التعدين

Training in the field of mining engineering covers:

- Geosciences (Geology, Geophysics, Petrography, Geostatistics); علوم الأرض (الجيولوجيا والجيوفيزياء والنفط والإحصاء الجيولوجي)
- Mathematics, Computer Science; والرياضيات وعلوم الحاسوب
- Rock Mechanics, Geomechanics; ميكانيكا الصخور، الميكانيكا الجيولوجية
  Surface and underground mining operations; عمليات التعدين السطحية والجوفية
- Valorization تقييم and mineral processing; تقييم التثمين وتجهيز المعادن
- Land Control and Geo Engineering; مراقبة الأراضي والهندسة الجغرافية
- Design تصميم and Numerical Modeling (CAD, CAD); التصميم والنمذجة العددية (CAD, CAD)
- Security, Economics and Business Management; الأمن والاقتصاد وإدارة الأعمال

Domain of intervention

The main areas of intervention of the mining engineer in mining engineering are:

- open-pit and underground mining industry, التعدين السطحي والجوفي ،
- development of extracted mineral substances, تطوير المواد المعدنية المستخرجة
- planning, operation, and management of mines. تخطيط وتشغيل وإدارة المناجم.
- Safety Protocols, بروتوكولات السلامة

They are also involved in various sectors of public works and civil engineering such as earthworks, basic infrastructure, and structures (bridges, tunnels, railways, dams...), land control, and Geo Risks.

Opportunities

The mining sector offers excellent employment opportunities both domestically and internationally. engineers work in the various sectors of mining, civil engineering, public works, public administrations (Ministries, control agencies), private sector, consulting and laboratories for analysis and testing of materials, research centers

employers

- Public administration الإدارة العامة
- Research centers مراكز البحوث
- Mining companies شركات التعدين
- Mining equipment companies شركات معدات التعدين
- Consulting engineering firms الشركات الهندسية الاستشارية
- Financial institutions المؤسسات المالية
- Processing plants مصانع التجهيز

Personal work of the student for this module

Working in groups/pairs: Reading articles on sustainable development and/or reports on successful and sustainable companies and drawing up summaries of the main actions undertaken in the field of SD.

- Examples of documents for reading and synthesis:

- Case of ONA and ENIEM: Kadri, Mouloud, 2009, Sustainable development, enterprise and ISO 14001 certification, Market and organizations vol. 1 (No. 8), p. 201-215 (free online access:http://www.cairn.info/revue-marche-et-organisations-2009-1-page-201.htm)

- Mireille Chiroleu-Assouline. Sustainable development strategies for companies. Ideas, The Journal of Economic and Social Sciences, CNDP, 2006, p 32-39 (free online access:http://halshs.archives-ouvertes.fr/hal-00306217/document)

- TOTAL Environmental and Societal Commitments webpage:https://www.total.com/fr/engagement

- PSA Group sustainable mobility innovations: http://www.annualreport.groupe-psa.com/report-2015/commitments/innovative-solutions-for-transport- sustainable/