Basic Sciences

Division

Department of Chemistry

Laboratory Hygiene and Safety

CUCEI

UNIVERSIDAD DE GUADALAJARA
CENTRO UNIVERSITARIO DE CIENCIAS EXACTAS E INGENIERÍAS

1.- GENERAL INFORMATION				
Learning unit Laboratory hygiene and safety		**Department** Chemistry		**Format** Lecture
Prerequisites (P) None	**Corequisites (CO)** None	**Ascribed Academy** Chemistry	**Module:** M4 Prevention and solution of problems in the area of chemistry.	
Type Basic particular mandatory	**Theory hours** 3 hrs. per week	**Practice hour** 0	**Total hours** 51 hrs.	**Credits** 7
Degree in which this class is taught: B.S in Chemistry.				

2.- GENERIC COMPETENCIES

-Problem solving
-Synthesis and analysis.
- Team work.
-Computer skills
-Managing information
-Oral and written production
-Discerning and decision making

Specific competencies:
- Autonomous development of the acquired knowledge.
-Ability to apply what is learnt to specific and complex situations.
-Autonomy and teamwork
- Ability to solve problems in case of an emergency in a chemistry lab.
- Ability to design emergency plans and drills according to the needs of each lab.

3.- SPECIFIC CHARACTERISTICS OF THE COMPETENCY

Knowledge	Students… • Discuss the fundamental concepts of work safety and hygiene in order to understand the way accidents occur and the work- related illnesses. • Define the specific theoretical principle in which the previous concepts are based on. • Explain the elements that are involved in an accident. • Are able to describe the missteps of the chemical processes that can trigger risk situations.

Skills	• Decide about the applicable regulations in different economic fields and activities. • Handle the databases of chemical substances and know how dangerous they are. • Apply the acquired knowledge in a project, using the applicable regulations. • Acquire the ability to analyze dangerous situations that involve chemical substances.
Aptitudes	• Identify and solve problems through hypotheses and the application of the necessary principles analytically and synthetically. • Relate the knowledge of different areas and apply it in every day and professional situations. • Develop study habits and manage their own learning. • State solution to specific theoretical and practical problems where the acquired knowledge is involved.
Values	• Develop and exercise values such as responsibility, honesty, tolerance, respect, solidarity, willingness and positive attitude towards individual and group work.

4.- TRANSVERSAL COMPETENCIES

☑	Foreign Language (English)
☑	Critical, analytical and synthetic thinking. a
☑	Oral and written expression
☑	Professional ethics
☑	Administration of human and material resources
☑	Leadership and sustainability
☑	Creativity, innovation and entrepreneurship
☐	Other

5.- COURSE CONTENT OF THE LEARNING UNIT

Unit 1. Introduction to laboratory safety and hygiene. Legal and institutional framework. Regulations.

1.1 Fundamentals of work safety in the Mexican constitution.
1.2 Basic knowledge of the General Health Law and the Federal Labor Law
1.3 Current regulations on occupational safety and the official 41 Mexican Official Regulations (NOM for its acronym in Spanish) of the Ministry of Health, Labor and Social Welfare (In Spanish STPS: *Secretaría del Trabajo y Previsión Social*)
1.4 Statistics of accidents and work-related illnesses in the last 10 years in Mexico and Jalisco.
1.5 The accident equation: unsafe act, unsafe condition, CRETIB (corrosive, reactive, explosive, toxic, inflammable and bio-hazardous) report quantity.

Unit 2
Risks and accidents linked to chemical substances: fire and explosions.

2.1 NOM-021-STPS-1994, general aspects.
    2.1.1 NOM-002-STPS-2008, general aspects.
2.2 Chemical risk linked to explosive and inflammable substances.
2.3 Types of fire and their extinctions.
2.4 Major types of accidents: BLEVE (boiling liquid expanding vapor explosion), UVCE (Unconfined Vapor Cloud Explosion), Pool Fire, Jet Fire, etc.

Unit 3
Risks and accidents caused by chemical substances: occupational health.

3.1 Health risks as a consequence of industrial pollution emissions Introduction to NOM-048-SSA1-1993
3.2 Introduction to poisoning NOM-010-STPS-1999.
3.3 Polluting chemical agents in the work environment. Recognizing, assessing and controlling them. Introduction to NOM-010-STPS-2014.
3.4 General aspects of sampling and analyzing pollutants on the work environment.

Unit 4.
High-risk activities not involving CRETIB substances.
4.1 Confined spaces
4.2 Differences between chemical, thermal and electrical burns.
4.3 Under pressure containers, boilers and working in low temperature environments.
4.4 Electrocutions

Unit 5. Risk communication, the tool to avoid accidents at work.
5.1 Globally harmonized system.
5.2 NFPA (National Fire Protection Association)704
5.3 HMIS (Hazardous Materials Identification System)
5.4 UN code
5.5 Emergency response guide: ERG.
5.6 HIN
5.7 Hazmat suit code
5.8 Basic concepts of labeling. Pesticides and chemical reagents.

Unit 6. Dangerous and non- dangerous fluids in the chemical industry and hazardous waste.
6.1 Generalities of NOM-018-STPS-2015
6.2 NOM-020-STPS-2011, Pressure vessels, cryogenic containers, and steam generators or boilers.
6.3 Signaling system regulations: NOM-026-STPS-2008
6.4 Generalities of NOM-005-STPS-1998
6.5 Generalities of NOM-052-SEMARNAT-2005
6.6 Generalities of NOM-087-ECOL-SSA1-2002

6.- ASSESSMENT	
☑	Numeric grade

7.- GRADING CRITERIA OF THE LEARNING UNIT	
7.- GRADING Indicator of evaluation LEARNING UNIT	**Percentage CRITERIA OF THE**
Departmental exams	40
Partial exam	0
Homework	10
Research activities	10
Practice reports	0
Class participation	0
Other: Project	40

8.- REQUIRED MATERIAL (for students)	
☐	Calculator
☐	Periodic table
☐	Lab coat
☐	Text book
☐	Workbook
☐	Other: notebook

9.-SPECIFIC CONTENT BY LEARNING UNITS						
Content unit	**Generic competency of the content unit**	**Topics**	**Class hours**	**Professor activities**	**Student activities**	**Bibliography**
Unit 1. Introduction to laboratory safety and hygiene. Legal and institutional framework. Regulations.	-Ability to synthesize and analyze the general federal laws. -Ability to identify national and international regulations. -Ability to manage information. -Ability to express themselves in the written form. - Ability to distinguish risk from danger.	1.1 Fundamentals of work safety in the Mexican constitution.	2 hr	Professor… -teaches the legal and institutional framework of occupational health in Mexico. - motivates the students to reflect about the evolution of workers' rights. - states situations that could cause accidents, considering the elements that can be involved.	Students… -play a prominent role in the search for information and solutions to problems stated by the teacher. - synthesize the official regulations of safety in Mexico. - perform tasks about the topic.	DOF, *Diario oficial de la federación.* Retrieved from http://www.dof.gob.mx/ley Federal Del Trabajo. Mexico. Statistics about accidents and work-related illnesses. Retrieved from: www.stps.gob.mx
		1.2 Basic knowledge of the General Health Law and the Federal Labor Law	1 hr			
		1.3 Current regulations on occupational safety and the official 41 Mexican Official Regulations (NOM for its acronym in Spanish) of the Ministry of Health, Labor and Social Welfare (In Spanish STPS: *Secretaría del Trabajo y Previsión Social*)	3 hr			
		1.4 Statistics of accidents and work-related illnesses in the	2 hr			

		last 10 years in Mexico and Jalisco.				
		1.5 The accident equation: unsafe act, unsafe condition, CRETIB (corrosive, reactive, explosive, toxic, inflammable and bio-hazardous) report quantity.	2 hr			
Unit 2 Risks and accidents linked to chemical substances: fire and explosions.	- Ability to create safe conditions to prevent and protect labs and work environments from fires. -ability to manage information.	2.1 NOM-021-STPS-1994, general aspects.	3 hr	Professor… -teaches the general concepts of fires, origins and control. - leads students to analyze how explosions and fires occur through the historical analysis and identification of	Students… -play a prominent role in the search for information and answers about elements and events that occurred and caused great disasters of the chemical industry that caused great	*Diario Oficial de la Federación:* NOM-021-STPS-1994, NOM-002-STPS-2008. Creus-Mangosio. *Seguridad e higiene en el trabajo, un enfoque integral*. Alfa-Omega México, 2011.
		2.2 Chemical risks linked to explosive and inflammable substances.	3 hr			
		2.3 Types of fire and their extinctions.	2 hr			

		2.4 Major types of accidents: BLEVE (boiling liquid expanding vapor explosion), UVCE (Unconfined Vapor Cloud Explosion), Pool Fire, Jet Fire, etc.	2 hrs	risks in well-known catastrophes. - Designs and hands in homework that fosters feedback on the topics seen in this learning unit.	fires and explosions. -Do homework of the concepts seen in class.	
Unit 3 Risks and accidents caused by chemical substances: occupational health.	- Ability to create safe conditions to prevent and protect labs and work environments from poisoning -ability to manage information.	3.1 Health risks because of industrial pollution emissions. Introduction to NOM-048-SSA1-1993 substances: occupational health.	3 hrs	Professor… -teaches the toxicological concepts and explains how poisoning occurs and their effects in the workers' health. -guides students to make groups and gives instructions to design a project: "A safe lab"	Students… -play a prominent role in the search for information and answers about elements and events in chemical industry that involved poisoning. -do homework of the concepts seen in class.	*Reglamento Federal De Seguridad, Higiene Y Medio Ambiente De Trabajo*. México. Updated. Jaramillo Juárez; Rinco Sánchez and Rico Martínez (2009). *Toxicología ambiental*. Universidad Autónoma de Aguascalientes, Mexico.
		3.2 Introduction to poisoning NOM-010-STPS-1999.	4 hrs			
		3.3 Polluting chemical agents in the work environment. Recognizing, assessing and controlling them. Introduction to NOM-010-STPS-2014.	2 hrs			

		3.4 General aspects of sampling and analyzing pollutants on the work environment.	2 hrs.			
Unit 4. High-risk activities not involving CRETIB substances.	Students know and are aware of the danger of working in confined spaces, using pressure vessels and with electricity.	4.1 Confined spaces	2 hr	Professor… -teaches the elements involved in accidents due to confined spaces, pressure vessels, variation of temperature and electrocutions.	Students… -play a prominent role by carrying out a project in teams about the operational critical variables of their processes. -analyze which regulations (not related to dangerous substances) are applicable to their project.	*Diario Oficial de la Federación:* NOM-033-STPS-2015 *Espacios confinados*. NOM-026-STPS-2008, *Colores y señales de seguridad e higiene, e identificación de riesgos por fluidos conducidos en tuberías.*
		4.2 Differences between chemical, thermal and electrical burns.	1 hr			
		4.3 Pressure vessels, boilers, and low temperature environments.	2 hr			
		4.4 Electrocutions	2 hr			
Unit 5. Risk communication, the tool to avoid accidents at work.	- Students apply analytical, synthetic and critical thinking to use the theoretical concepts in the application of	5.1 Globally harmonized system.	2 hr	Professor… Teaches the basic concepts to create a system to communicate dangers according to the	Students… -play a prominent role by creating a project in teams about the signal system and the danger codes.	UNECE (2009), Sistema Globalmente Armonizado de Clasificación y Etiquetado de Productos Químicos. Tercera edición revisada. Ginebra, Suiza.
		5.2 NFPA (National Fire Protection Association) 704	30 min			

	symbols, colors and codes to express the chemical, toxic, radioactive and sanitary dangers.	5.3 HMIS (Hazardous Materials Identification System)	30 min	national and international criteria applicable to the chemical industry. -Guides the students to apply the communication of danger tools to their project.	-analyze which guidelines are involved in the communication of dangers.	*Diario Oficial de la Federación:* NOM-018-STPS-2015, NOM-020-STPS-2011, NOM-026-STPS-2008, NOM-005-STPS-1998.
		5.4 UN numbers	1 h			
		5.5 Emergency response guide: ERG.	1 h			
		5.6 HIN	30 min			
		5.7 Hazmat suit code	30 min			
		5.8 Basic concepts of labeling. Pesticides and chemical reagents.	1 hr			
Unit 6. Dangerous and non- dangerous fluids in the chemical industry and hazardous waste.	- Know and distinguish the codes and information systems for dangerous fluids. - Understand the correct way to	6.1 Generalities of NOM-018-STPS-2015	1 h	Professor… -teaches the basic concepts to recognize how hazardous waste from the chemical industry are as well as the	Students… -play a prominent role by creating a project in teams about the signal system of places where chemical substances are stored and where	Programa Internacional de Seguridad sobre Sustancias Químicas (PISSQ/PNUMA-OIT-OMS), Washington, D.C. 1998 (Disponible en la biblioteca virtual de COFEPRIS)
		6.2 NOM-020-STPS-2011, Pressure vessels, cryogenic containers, and steam generators or boilers.	30 min			

	storage dangerous materials as well as the disposal of hazardous wastes.	6.3 Signaling system regulations: NOM-026-STPS-2008	30 min	generalities to treat them and dispose them. -guides the students to apply the color tools on pipes to communicate dangers.	hazardous wastes are generated. -analyze which guidelines are involved in the storing of chemical substances. -design a compatibility chart for their project.	Collin Baird. *Química Ambiental.* Editorial Reverté. Mexico, 2004. *Diario Oficial de la Federación.* NOM-052-SEMARNAT-2005. NOM-087-ECOL-SSA1-2002
		6.4 Generalities of NOM-005-STPS-1998	1 h			
		6.5 Generalities of NOM-052-SEMARNAT-2005	1 h			
		6.6 Generalities of NOM-087-ECOL-SSA1-2002	2 h			

COURSE EVIDENCES (Deliverables)

- **Departmental exam**
- **Research tasks**
- **Project**

10.-PROFESSOR'S PROFILE

Bachelor, Master or Doctorate degree in Chemistry or related degrees.
Specific knowledge in industrial safety and occupational health.
Teaching experience in safety and hygiene, dangerous wastes, environmental impact, environmental pollution and pollution control

11.-AUTHOR OF THE LEARNING UNIT
Eire Reynaga Delgado

12.-MODIFICATION AND UPDATE
July 4, 2016