

# Course Syllabus

Classifying and Labelling Chemicals According to the UN GHS

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## Background

Do you need to understand how to classify chemicals or develop and interpret chemical labels and safety data sheets (SDS)? Do you wish to gain a better understanding of the basics of chemical safety and how to define and communicate chemical hazards?

The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) was adopted by the UN ECOSOC in 2003. The GHS is an important tool that countries can draw upon to develop national chemical hazard communication systems by providing a basis for the establishment of comprehensive chemical safety programmes. Increasingly being implemented around the world, the GHS represents a key step in harmonizing national chemical hazard communication systems worldwide and has great potential to improve chemical safety across all relevant sectors.

In order to provide interested stakeholders from government, business, civil society, and academia with training on the GHS, the United Nations Institute for Training and Research (UNITAR) is offering this interactive e-learning course. The course is adapted from the GHS training course materials developed by UNITAR, ILO, and Orange House Partnership (OHP), and peer-reviewed by a technical advisory group of UNITAR/ILO in the context of the UN Subcommittee of Experts on the GHS (UN SCEGHS).

This course syllabus provides a detailed overview of the course and, therefore, is a necessary document for students to have at their disposition. The course is provided through the UNITAR Virtual Learning Environment (VLE).

## Target Groups and Learning Objectives

The course targets the following groups and individuals:

- GHS competent authorities;
- Civil servants in national ministries, provincial departments, and local authorities (“regulators”);
- Environmental and occupational safety managers in the private sector;
- Private sector employees responsible for hazard assessment/classification and preparing labels and safety data sheets;
- Civil society organizations interested in consumer safety, chemicals management, or right-to-know; and
- Faculty, researchers, and students.

As this is an advanced and technical course, participants are expected to have a solid basic knowledge in natural sciences (chemistry, biology/medicine) and in mathematics (for rather non-advanced equations -e.g., see sub-section 2.4.4.2 in the GHS document), as well as some experience with non-GHS classification systems and/or in hazard/risk assessments

Participants will learn about the purpose, scope, and application of the GHS; classification of hazardous substances and mixtures; and hazard communication (labelling and safety data sheets).

After completing the course, participants will be able to:

- Describe the international policy framework for the GHS and international chemicals management;
- Apply GHS criteria in classifying physical, health, and environmental hazards;
- Select appropriate hazard communication elements;
- Develop classification for safety data sheets and GHS-based labels; and
- Develop effective hazard communication strategies adapted to specific contexts.

## Course Structure and Content

The course is composed of 4 modules based on the structure of the GHS Document (“Purple Book”). Each module has specific learning objectives and is sub-divided into lessons. The 4 modules, based on the timeline provided below, are made available through the UNITAR VLE.

References to parts or key paragraphs in the training are to the latest version of the Purple Book. View the GHS on the UN website under the following link:

<https://unece.org/transport/dangerous-goods>  
[https://www.unece.org/trans/danger/publi/ghs/ghs\\_welcome\\_e.html](https://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html)

### **Module 1: Introduction, Scientific and Regulatory Principles, Hazard Classification, and Hazard Communication – 1 week**

#### Learning objectives

After completing Module 1, participants will be able to:

- Define the GHS hazard classification process and the provisions of the GHS that provide guidance for classification of hazards;
- Recognise the scientific principles underlying the classification process; and
- Analyse the elements of the GHS that address the communication of hazards.

#### Lessons

- 1.1 Background of the GHS
- 1.2 Scope and Application of the GHS to Chemicals and Sectors
- 1.3 Hazard Classification
- 1.4 Hazard Communication

#### Discussion Forum

- ☐ Discussion Forum - Module 1

#### Assessments

- ☐ Test for Module 1
- ☐ Open Question Module 1

### **Module 2: Classification of Physical Hazards – 3.5 weeks**

#### Learning objectives

After completing Module 2, participants will be able to:

- List the physical hazards that are covered by the GHS;
- Analyse the criteria for evaluating the physical hazard potential of substances and mixtures; and
- Apply the criteria to example substances and mixtures.

#### Lessons

Introduction to Module 2

- 2.1 Explosives
- 2.2 Flammable Gases
- 2.3 Aerosols
- 2.4 Oxidizing Gases
- 2.5 Gases under Pressure
- 2.6 Flammable Liquids
- 2.7 Flammable Solids
- 2.8 Self-reactive Substances and Mixtures

- 2.9 Pyrophoric Liquids
- 2.10 Pyrophoric Solids
- 2.11 Self-heating Substances and Mixtures
- 2.12 Substance and Mixtures which, in Contact with Water, Emit Flammable Gases
- 2.13 Oxidizing Liquids
- 2.14 Oxidizing Solids
- 2.15 Organic Peroxides
- 2.16 Corrosive to Metals
- 2.17 Desensitized Explosives

#### Discussion Forum

- ☐ Discussion Forum - Module 2

#### Assessments

- ☐ Test for Module 2
- ☐ Open Questions Module 2

### Module 3: Classification of Health Hazards – 3 weeks

#### Learning objectives

After completing Module 3, participants will be able to:

- List the health hazards that are covered by the GHS;
- Review the procedures for classifying untested mixtures;
- Analyse the criteria for evaluating the health hazards of substances and mixtures; and
- Apply the criteria to example substances and mixtures.

#### Lessons

Pre-lesson – Bridging Principles

- 3.1 Acute Toxicity
- 3.2 Skin Corrosion/Irritation
- 3.3 Serious Eye Damage/Eye Irritation
- 3.4 Respiratory or Skin Sensitization
- 3.5 Germ Cell Mutagenicity
- 3.6 Carcinogenicity
- 3.7 Reproductive Toxicity
- 3.8 Specific Target Organ Toxicity – Single Exposure
- 3.9 Specific Target Organ Toxicity – Repeated Exposure
- 3.10 Aspiration Hazard

#### Discussion Forum

- ☐ Discussion Forum - Module 3

#### Assessments

- ☐ Test for Module 3
- ☐ Open Questions Module 3

### Module 4: Classification of Environmental Hazards – 1 week

#### Learning objectives

After completing Module 4, participants will be able to:

- List the environmental hazards that are covered by the GHS;
- Analyse the criteria for evaluating the environmental hazard potential of substances and mixtures; and

- Apply the criteria to example substances and mixtures.

### Lessons

- 4.1 Hazardous to the Aquatic Environment
- 4.2 Hazardous to the Ozone Layer

### Discussion Forum

- ☐ Discussion Forum - Module 4

### Assessments

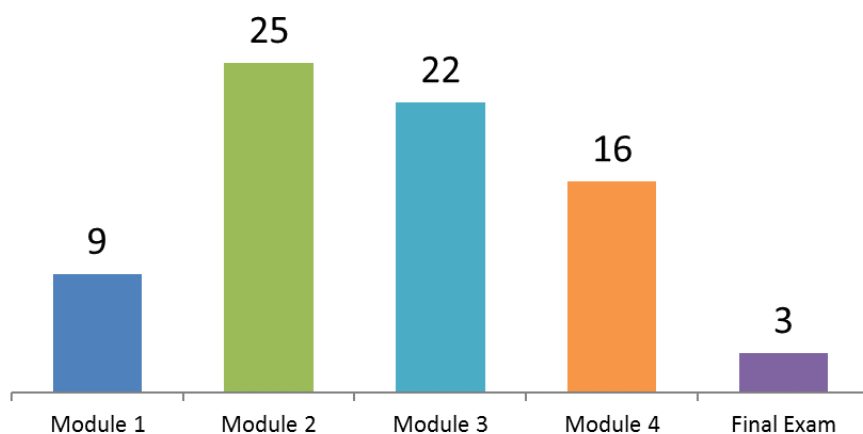
- ☐ Test for Module 4
- ☐ Open Question Module 4

## Learning Methodology

The course lessons, exercises, and assessments were designed by professionals working in the field of GHS with over 40 years' experience in this area. The course pedagogy is adapted to professionals in full-time work. Participants are provided with the opportunity to learn through various experiences: read, do, interact and reflect to one's own reality.

The course is delivered in an asynchronous manner to allow each participant to set his or her own learning schedule. The total amount of work expected for the completion of this online course is estimated at approximately 75 learning hours over an 11-week period.

The chart below indicates the estimated learning hours of each of the modules of the course.



## Materials and Activities

### Lessons

Lessons introduce you to the contents of the module. They were composed based on the structure of the “Purple Book” which allows you to easily refer to it. Some lessons are longer than others and you can have an estimative of the time you would need to go through them in the Study Plan. The lessons for each module will open accordingly to the course schedule and will remain available until the end of the course, so you may access them according to your needs.

All lessons in the course are available through the platform and when relevant they include interactive questions and interactive model exercises that will give you an opportunity to check the acquired knowledge and get immediate feedback. These model exercises are also available under Additional Resources and they may be repeated freely. Results are not measured; they do not count towards the final grade.

**Model exercises** are interactive exercises composed from a series of multiple choice questions that will provide you immediate feedback.

A compilation of the lessons is also provided in PDF format to allow offline access and facilitate printing.

### Exercise Booklets

Exercise booklets are provided for Modules 2, 3, and 4 respectively. They are composed by a series of exercises made available through one document that you may download. They will enable you to apply the concepts learnt in the lessons. These exercises are not graded and you can take them as many times as you want. Though they are not mandatory, they are strongly recommended to test/practice your knowledge to prepare for the tests/final examination. Answers to these exercises are provided separately on the platform to accommodate different learning styles and schedules. In case of difficulties or questions, you can contact the e-learning team at [ghs@unitar.org](mailto:ghs@unitar.org) and your question will be directed to the relevant tutor.

### Discussion Forums

Discussion Forums foster interaction and reflection on issues related to the practical implementation of the GHS, and will encourage learners to develop relationships among their peers. The discussions are supported by the expert tutors.

Each module of the course presents a different discussion forum that you may use to interact with your peers and the facilitators. In these discussion forums, the facilitators will propose a specific topic according to the subjects covered in the lessons.

The Open Discussion Forum is an open space for you to start any discussion regarding the subject of the course at any time. You can use this forum to talk with other participants and discuss the subjects related to the course, at any time.

### Assessments and Final Exam

*Tests, Open Questions* and *Final Exam* are mandatory and evaluate your understanding of key facts and concepts at the end of each module and the course.

### Additional resources

*Additional resources* and readings are provided to help you to deepen your understanding of specific issues depending on your particular needs and interests. A *Glossary of Terms* provides definitions of relevant concepts and technical terms for each module.

### Course Evaluation

This is where we invite you to tell us your opinion about the course. Complete the questionnaire at the end of course, providing us with feedback on your learning experience. Your opinion and inputs will help UNITAR to improve the quality of the course.

### Study Plan

The total amount of work expected for the completion of this online course is estimated at approximately 75 hours. Depending on the participants' individual learning speed, the more technical modules may require additional time.

Each module follows the same pedagogical structure: introduction and learning objectives; core content (lessons); practice exercises; discussion forum; assessments.

You will have access to each new module based on the timetable provided below (NB: the dates are based on the time in Geneva). Once available, modules will remain accessible until the end of the course.

Before moving from one module to another, please make sure that you have completed the mandatory reading, posted in the forum, answered the open question and taken the test. It is recommended that you complete all the mandatory and optional learning activities related to each module.

The following study plan presents all the activities of each module, their opening and closing days and an expected time. You may use it as an organizer.

Use the Study Plan below as an organizer.

- Plan for all the activities you have to do in this module.
- Consider the expected time indicated per each activity as a rough estimation. Learners learn at different paces, but this can be useful as an indication.
- Please note that the opening and closing days refer to Geneva time. Please consider that when organizing yourself.

| Activity                                                                                                                                                                                                                                                                        | Status           | Expected Time |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------|
| <b>Lessons:</b><br>1.1 Background of the GHS<br>1.2 Scope and Application of the GHS to Chemicals and Sectors<br>1.3 Hazard Classification<br>1.4 Hazard Communication                                                                                                          | <b>Mandatory</b> | 5-7h          |
| <b>Discussion Forum – Module 1</b>                                                                                                                                                                                                                                              | Recommended      | 20 min        |
| <b>Test for Module 1</b>                                                                                                                                                                                                                                                        | <b>Mandatory</b> | 1.5h          |
| <b>Open Question Module 1</b>                                                                                                                                                                                                                                                   | <b>Mandatory</b> | 30 min        |
| Activity                                                                                                                                                                                                                                                                        | Status           | Expected Time |
| <b>Lessons:</b><br>Introduction to Module 2<br>2.1 Explosives<br>2.2 Flammable Gases<br>2.3 Aerosols<br>2.4 Oxidizing Gases<br>2.5 Gases Under Pressure<br>2.6 Flammable Liquids<br>2.7 Flammable Solids<br>2.8 Self-reactive Substances and Mixtures<br>2.9 Pyrophoric Liquids | <b>Mandatory</b> | 11-13h        |

|                                                                                                                                                                                                                                                                                                                                                         |                  |      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------|
| <b>2.10</b> Pyrophoric Solids<br><b>2.11</b> Self-heating Substances and Mixtures<br><b>2.12</b> Substances and Mixtures which, in Contact with Water, Emit Flammable Gases<br><b>2.13</b> Oxidizing Liquids<br><b>2.14</b> Oxidizing Solids<br><b>2.15</b> Organic Peroxides<br><b>2.16</b> Corrosive to Metals<br><b>2.17</b> Desensitized explosives |                  |      |
| <b>Module 2 Exercise Booklet</b>                                                                                                                                                                                                                                                                                                                        | Recommended      | 7-9h |
| <b>Discussion Forum – Module 2</b>                                                                                                                                                                                                                                                                                                                      | Recommended      | 0.5h |
| <b>Test for Module 2</b>                                                                                                                                                                                                                                                                                                                                | <b>Mandatory</b> | 3h   |
| <b>Open Questions – Module 2</b>                                                                                                                                                                                                                                                                                                                        | <b>Mandatory</b> | 1h   |

| Activity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Status           | Expected Time |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------|
| <b>Lessons:</b><br>Pre-lesson – Bridging Principles<br><b>3.1</b> Acute Toxicity<br><b>3.2</b> Skin Corrosion / Irritation<br><b>3.3</b> Serious Eye Damage / Eye Irritation<br><b>3.4</b> Respiratory or Skin Sensitization<br><b>3.5</b> Germ Cell Mutagenicity<br><b>3.6</b> Carcinogenicity<br><b>3.7</b> Reproductive Toxicity<br><b>3.8</b> Specific Target Organ Toxicity - Single Exposure<br><b>3.9</b> Specific Target Organ Toxicity - Repeated Exposure<br><b>3.10</b> Aspiration Hazard | <b>Mandatory</b> | 10-12h        |

|                             |                  |        |
|-----------------------------|------------------|--------|
| Module 3 Exercise Booklet   | Recommended      | 5-7h   |
| Discussion Forum – Module 3 | Recommended      | 30 min |
| Test for Module 3           | <b>Mandatory</b> | 2h     |
| Open Questions – Module 3   | <b>Mandatory</b> | 1h     |

| Module 4: Classification of Environmental Hazards                                        |                  |             |             |               |
|------------------------------------------------------------------------------------------|------------------|-------------|-------------|---------------|
| Activity                                                                                 | Status           | Opening day | Closing day | Expected Time |
| Lessons:<br>4.1 Hazardous to the Aquatic Environment<br>4.2 Hazardous to the Ozone Layer | <b>Mandatory</b> | 4 May       | 10 May      | 7-9h          |
| Module 4 Exercise Booklet                                                                | Recommended      | 4 May       | -           | 4-5h          |
| Discussion Forum - Module 4                                                              | Recommended      | 4 May       | -           | 30 min        |
| Test for Module 4                                                                        | <b>Mandatory</b> | 4 May       | 10 May      | 2h            |
| Open Question Module 4                                                                   | <b>Mandatory</b> | 4 May       | 10 May      | 30 min        |

| Final Exam and Course Evaluation |                  |                 |             |               |
|----------------------------------|------------------|-----------------|-------------|---------------|
| Activity                         | Status           | Opening day     | Closing day | Expected Time |
| Final Exam                       | <b>Mandatory</b> | 11 May          | 26 May      | 3h            |
| Course Evaluation                | Recommended      | Upon completion |             | 15 min        |

Grading/feedback for tests and forums will normally be provided within 1 week. Please note that while justified delays in submission of assignments are accepted, this may result in delayed feedback from the tutors.

## Completion Requirements

To receive a certificate of completion, you must successfully complete the following activities:

- *Open Questions* related to all course modules.
- a *test* at the end of each of the 4 modules; and
- a *final exam* consisting of 2 multi-hazard exercises.

The **open questions are graded as “complete” (1) or “incomplete” (0)**. For “incomplete” answers, the tutor will provide feedback to guide the learner to improve his/her answer(s).

**The pass grade for each test and final exam is 70%.** If you obtain less than 70% in your first submission, you will be requested to re-submit your answers based on feedback from the tutors, and must obtain an average grade of at least 70% over the two submissions for each individual test and the final exam.

## Course Tutors

There are 2 tutors for the course: Dr. Helmut Fleig and Ms. Kim Headrick. The role of the tutors is to support the participants on understanding course content and exercises, as well as to review open questions answers, tests and the final exam.

**Dr. Helmut Fleig** will advise on the following modules:

Module 2 – Classification of Physical Hazards  
Module 4 – Classification of Environmental Hazards

**Ms. Kim Headrick** will advise on the following modules:

Module 1 – Introduction, Hazard Classification, Scientific Principles and Hazard Communication  
Module 3 – Classification of Health Hazards

The tutors' biographies can be found on the VLE under "Biographies of Course Tutors".

## GHS e-Learning Team

Throughout the course, the participants and course tutors are supported by the GHS e-Learning Team. This team seeks to ensure the smooth running of the course, facilitate communication between participants and tutors, advise on learning difficulties, and resolve any technical issues.

The biographies of the members of the GHS e-Learning Team can be found on the VLE under "GHS e-Learning Team".

## Contact Information

For any technical issues or coordination matters, please contact the Chemicals and Waste Management Programme's GHS e-Learning Team by posting in the "Technical Support" Forum, by sending a message through the UNITAR VLE, or by e-mail or phone. E-mails will normally be answered within 24 hours.

### The GHS e-Learning Team

Contact Person: Ms. Emma Jaena  
E-mail: [ghs@unitar.org](mailto:ghs@unitar.org)  
Phone: +41 22 917 83 92  
Office location: Geneva, Switzerland

## Technical Requirements

Access to the Internet is an essential condition for participation. In case of unreliable connection or for ease of access (e.g. while travelling), the course content can be downloaded in e-book format. UNITAR also recommends the following as a minimum in hardware and software to take this e-learning course:

- Windows 7 or higher, MacOS X for Apple computers
- At least 2Gb of RAM, 4 G of free disk space
- Microsoft Word, Adobe Acrobat Reader (downloadable for free at <http://www.adobe.com>)
- Internet Explorer 10 and later version, Mozilla Firefox and Chrome - JavaScript, pop-ups and cookies must be enabled

Your network administrator or a person who has basic knowledge of hardware and networks will be able to tell you whether or not your computer/setup meets the requirements.

## Services for Disabled Students

Should you require any special services to enable you to succeed in completing the course, please contact us directly for advice at [ghs@unitar.org](mailto:ghs@unitar.org).