

**CENTER FOR INTERNATIONAL PROGRAMS & SUSTAINABILITY STUDIES**

**COURSE NAME:** Introduction to the physical and chemical basis of everyday life

**COURSE CODE:** CHEM 1050

**TOTAL CONTACT HOURS:** 60

\*This syllabus is tentative and subject to change. A new copy will be provided if changes are made. \*

**Course Description**

This course is designed for students of non-scientific fields that strive to understand the chemical and physical (PChem) basis of everyday life. The course concentrates on simple but important aspects of modern day societies, such as X rays and CAT scans, the production and utilization of gasoline and polymers, the chemical fate and impact of chemicals on the environment and a variety of technical and scientific aspects related to human life concerns. All scientific and technical issues are studied through a question/answer approach. Class demonstrations and field trips are included to illustrate specific subjects.

**Audience**

This course is structured for International Students attending the Study Abroad program at Universidad Veritas. However, courses are not exclusive to foreigners so native students could enroll in this course if they so wish.

**Attendance and code of conduct**

Students are required to attend all class sessions, demonstrations or field trips. However, two non-consecutive sickness leaves are permitted when official documents (Doctor or clinic, signed) are presented within a week of the absence. Three late arrivals (15 min or more) will count as an absence.

Students are required to turn off all electronic devices and behave respectfully to teachers and classmates alike. Eating or drinking during class sessions are prohibited. Noncompliance to any of above requirements can result in class expel and the consequential loss of credits.

**Electronic devices**

The use of cell phones, smart phones, or other mobile communication devices is disruptive, and is therefore prohibited during class. **Please turn all devices OFF and**

**put them away when class begins.** Devices may be used ONLY when the professor assigns a specific activity and allows the use of devices for internet search or recording. Those who fail to comply with the rule must leave the classroom for the remainder of the class period.

### **Course prerequisites**

This course is intended for students with the basic high-school scientific background, but those with additional chemistry and physics knowledge will also find it appropriate.

### **General problem**

This is a theoretical-practical course and it seeks to clarify the following question:  
What are the principles of Chemistry and Physics that permeate our everyday life?

In order to answer this question, this course will study the following:

- Distinction and complementarity of Chemistry and Physics
- Natural and synthetic materials
- Waves
- Energy
- Environment
- Biochemistry and Biophysics principles

The course will promote the development of the following skills:

- Ability to obtain basic PChem information from reliable sources
- Ability to propose PChem explanations to ordinary life phenomena
- Ability to analyze, discuss and communicate basic PChem facts

Some of the values and attitudes fostered among students are the following:

- Inquisitive mind
- Problem solving
- Learning how to learn
- Acknowledgement of the important role PChem plays in our life
- Teamwork and leadership

The following competencies, sub-competencies and performance evidences will be part of the course

Competences	Key competencies	Evidence of learning
<p><b>Discipline</b></p> <p>Applies the scientific method to ordinary or everyday processes to find the PChem principles and scientific truth that lay underneath them according to logical deduction or synthetic thinking.</p>	<p>Observes daily ordinary facts following systematic scientific procedures of observation.</p>	<p>Oral discussions and presentations with written reports</p>
	<p>Proposes scientific explanations to daily facts according to accepted scientific procedures</p>	
	<p>Discusses scientific finding according to scientific standards</p>	
	<p>Reports scientific findings following accepted American Chemistry Society (ACS) or American Physics Association (APA) reporting standards.</p>	

General	Sub-competencies	Performance evidence
Integrates scientific thinking as a way of living	Identifies reliable sources of information	Class discussion Reports
Develops a working awareness of the important role that PChem plays in our life	Proposes solutions to subject matters that were not part of the course but are important to the student personally.	Class discussion Reports
Integrates knowledge, skills and attitudes to learn continuously and through one's life pursuing an efficient development in the knowledge-based society.	Learns to learn	Written and oral reports
Builds the necessary knowledge, skills and attitudes to learn how to communicate orally and in written form in the different disciplines that make up the curriculum.	Communicates thoughts of the basic Physics, Chemistry, Biochemistry and Biophysics orally and in written form.	Class discussions, oral presentations and written reports.
Integrates the necessary knowledge, skills, and attitudes to learn teamwork and leadership techniques.	Executes teamwork and leadership.	Collaborative work

**Course Contents**

## **Chapter 1 Introduction**

What is the difference between Physics and Chemistry?

What is Physical-Chemistry?

What is Biochemistry?

What is Biophysics?

What other fields are related to Chemistry and Physics?

Lab demonstration session: chemical vs physical change

## **Chapter 2 Natural and Synthetic Materials**

What is the difference between natural and synthetic materials?

What are the different ways to extract and refine natural materials? (including: Iron, Aluminum, Salt, Silicon, Petroleum, Oxygen, etc.)

What is the difference between cement and concrete?

What products are obtained from petroleum?

What is the difference between diesel and gasoline?

How do gasoline motors differ from diesel motors?

How are different polymers (nylon, plastics, PVC, rayon, etc.) produced?

Lab demonstration session: simple distillation or difference between soaps and detergents

## **Chapter 3 The wave phenomena**

What are waves?

What are sonic waves?

What are electromagnetic waves?

How are the different waves used in telecommunications, X Rays, photography, Magnetic Resonance, Ultrasound, Sonar, etc.?

Lab demonstration session: transmission and attenuation of sound and light waves.

## **Chapter 4 Energy issues**

What is temperature?

What is the difference between temperature and heat?

What is energy?

What are the different forms of energy?

How is energy different from work?

How are the different forms of energy “produced”?

How are the different forms of energy used in society?

What is energy efficiency?

Why is incandescent light producing devices more inefficient than fluorescent light producing devices?

Why are LED devices more efficient than fluorescent light?

Lab demonstration session: Heat dissipation by light devices.

## **Chapter 5 Environment (2 field trips)**

What is atmospheric pressure?

What is the difference between relative humidity and absolute humidity?

How does humidity affect the body sensitivity of warm and cold?

How does pressure vary with height?

How does pressure vary with deepness?

How does temperature vary with height?

Why is it more difficult to maintain high level of exercise at higher grounds?

What is the hydrologic cycle?

How is potable water produced?

What are the domestic sources of water pollution?

What is the difference between soaps and detergents?

What are pesticides? How does their degradability and persistence affect us?

How does water transport materials and contaminants?

How does human construction affect water channeling?

Field trips: Los Santos y Orosi

## **Chapter 6 Biochemistry and biophysics issues**

How does the body produce the energy to sustain exercise?

What is the process of Oxygen/Carbon Dioxide exchange?

What is the effect of pressure on Oxygen and Carbon Dioxide solubility?

What are the risks for alpinists and divers?

## **Methodology**

Problem solution is the main methodology applied in this course. The course will be carried out much in the same way that the program is written, that is, in the question and answer manner. After a small introduction regarding the generalities of the topic, relevant questions will be presented and students are expected to suggest answers and discuss possible solutions. The professor will encourage active participation of the students in classroom. Some of the more demanding topics will require students to look for sources of information and to perform self-instructing study. In those cases, students will submit a small written, "question report" and prepare themselves to

discuss their findings in the classroom. The idea of these reports is not so much to copy the source but to show that the student comprehends by, perhaps, relating the topic to other subjects, producing new questions or pointing out doubts that remain unanswered.

Group assignments will be given, and the group will be free to elect how to distribute work, but all members must commit to participate in about the same intensity. The course also incorporates some “in class” demonstrations with discussions. A report of each demonstration is due the week after.

Although this program contemplates six guideline topics, not necessarily all will be studied. Coverage will depend on the particular student population and its particular interest. Students with a particular interest can use the questions as a reference to further their study.

Two field trips will be taken. Their main goal is to direct attention to important and specific subject topics studied in the course. The idea is not to have the instructor point out the problems and answers but to encourage the students to observe and identify problems and issues that relate to the course. Each field trip will require a written report

### **Educational Resources**

In order to guarantee good development of the course so as to ensure learning, the following resources are available: an updated bibliographic database, multimedia equipment that students can use for their individual presentations; whiteboards and other school equipment for weekly sessions, and readings provided by the educator. All of these complement the suggested projects and provide the students with higher possibilities of knowledge appropriation. Most of the lessons will take place in the classroom.

During independent work periods students will be able to attend the institution.

A campus library, study rooms, and computer labs are available for the students' independent work time. Free Wi-Fi connection for students, educators, and staff is provided on campus, which gives students the possibility to work not only in the library or computer labs, but also around campus.

### **Learning Strategies**

The following learning strategies will be developed:

- 1. Individual or group presentations of topics assigned by the professor**

The students, either, individually or in groups, will make an oral presentation accompanied by a written report based on assigned questions. The idea is that these presentations not only provide answers but also serve as basis for discussion and broaden the scope of the subject being discussed. These assignments will be worth 10% of the final grade. All members of a group will be assessed according to the same criteria.

**2. Individual or group presentations based on personal interest.**

The students, either, individually or in groups, can request to make an oral presentation accompanied of a written report based on questions or matters of their own interests. Again, the idea is that these presentations not only provide answers but also serve as basis for discussion and broaden the scope of the subject being discussed. These assignments will be worth 10% of the final grade. In the cases of group presentations all members of the group will be assessed according to the same criteria and given the same grade.

**3. Demonstration reports**

Several demonstrations will be carried out by the professor in the classroom and each will provide material for a report of observations, discussions and conclusions. The reports will be worth 10% of the final grade.

**4. Field trip reports**

The field trips are designed to allow the students to observe, analyze real life issues and propose practical solutions. A set of questions are given in advance to serve as a guideline of observation. The written report is expected to emphasize analysis and propose possible solutions. Each report will be worth 10%.

**“Los Santos” field trip report details.**

Students are encouraged to observe and write a report considering, at least, the following questions:

How does slope contribute to soil degradation?

How does cattle farming on slopes contribute to soil degradation?

How do trees contribute to prevent soil degradation?

How does human construction impact environment?

**“Orosi” field trip report details.**

Students are encouraged to observe and write a report considering, at least, the following questions:

What size of particles can a water way transport?

What sizes of rocks can be transported by rivers?

How does slope contribute to rock transportation?

How does water current contribute to rock transportation?



What other factors contribute to water transport of rocks?  
What are the risks associated to waterways?

### **General format for assignments**

A specific rubric is provided for each assignment, for the students to know in advance the way they will be assessed. The following are general but mandatory requirements for all written assignments:

- 12 pt. Times New Roman, Arial, Century Gothic or Calibri font, in letter size pages
- 1.5 spacing
- Name, class, and date in header \*
- Align margins with page borders \*\*
- Submit electronically to Canvas platform and send it to the professor to [mario.segnini@gmail.com](mailto:mario.segnini@gmail.com)

References must be included in text and a references section must be included at the end of each assignment using APA style, most recent version.

\* Header Example:

Veritas University

Introduction to the physical and chemical basics of everyday life

Field Trip Report #1: Los Santos

Mario Segnini Boza

August 7th, 2018

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- Use a line to separate heading from the rest of the report
  - Leave a space between the header and the beginning of the text
  - Do not include the header on every page, but only on the first one

All written assignments have a deadline to be sent, and will not be received after this deadline, without exceptions. It is each student's responsibility to be aware of each assignment deadline.

**\*\*Note:** Remember to use third person for all your written reports and align margins with page borders by selecting the option that aligns the text with both margins:

### **For All Presentations:**

These aspects will always be taken into account for presentations:

- Preparation and content: topic relevance, knowledge assimilation, answers to classmates' and professor questions, and content deepness due to evident research.
- Organization and style: smoothness, independence from notes and devices, speaking clarity, slides clarity and aesthetics, text and images balance.
- Time limit respect: each presentation has a time limit; students will be informed about this in advance.
- Personal opinion: robust personal opinion reflecting serious analysis of the topic and previous research.
- Punctuality: presentations must be presented on the assigned date, not following this rule means a grade of 0% on that particular presentation unless the absence or lack of assignment is properly justified.

### **Learning Assessment**

Veritas University encourages responsibility and fair judgement capacity by allowing students to evaluate themselves (Auto-evaluation) and their peers (Co-evaluation), along with the Instructor's evaluation to make up the final grade. Thus, each 10% in the following Rubric Table is made up of 5% from Instructor's, 3% from peers and 2% from Auto-evaluation. Students that request to make more than 2 presentations on subjects of their own interest, will have a corresponding higher percentage value on that rubric.

### **Evaluation:**

<b>RUBRIC</b>	<b>PERCENTAGE VALUE</b>
Assigned presentation (3)	30%
Free or personal interest presentation (2)	20%
Field trip report (2)	20%
Demonstration report (3)	30%
<b>Total</b>	<b>100%</b>

**Rubric for Field Trip Reports**

This course includes two mandatory Field Trips. Main meals are covered by the course.

The mandatory field trips in this course are not excursions. Only students enrolled in this course may attend. Field work might include volunteer work that might be considered harsh or strenuous for students who have not done fieldwork before. Students must be on time for all field trip related activities including departure, return and scheduled meal times. Some of the areas are in winding roads so students who get motion sickness might be uncomfortable in these field trips.

Students must carry small notebooks (or phones) to write down anything they see or learn while in the field and what they think about it, especially things related to what has been or will be studied in class. Each person's notes will be unique, not only in that each person notices different things, but also interprets similar things differently. Notes will help students write the field trip report, which is a formal paper that mirrors the field trip experience and learning.

Field Trip reports contain information about what the students see and learn in the field and personal opinions based on knowledge and observation. Photographs can be helpful when writing the reports. Each report is two 1.5-spaced pages minimum (not including images nor References section) extending to a maximum of five pages, depending on the amount of activities performed during the trip. This is a formal paper, follows the general format indicated for the rest of written assignments, including APA style for references. The assessment is performed using the following rubric:

Excellent 4 pts	Very good 3 pts	Sufficient 2 pts	Insufficient 1 pt
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Indicator	Grade	Observations
The report includes a header with the name of the university, the student, and the course, title of the Field Trip and a line that separates the header from the rest of the work and follows the structure given in the example.		

Organization (report structured according to sections): Introduction, Objectives, Summary of activities, Observations, Analysis, Conclusions, Bibliography and annexes, if necessary.		
The "Introduction" provides a general idea of the content of the report.		
The "Summary" describes all the substantive activities carried out.		
The "Objectives", general and specific, of the field trip.		
The "Observations", lists all relevant facts or findings.		
The analysis is a personal appraisal of how the different facts integrate into a whole problem. If the report includes data it should be presented in tables, accompany of charts and graphs according to their nature and following the APA format.		
The "Conclusions" is a discussion of consequences, recommendations and possible solutions to solve the integrated problem.		
The bibliographic sources follow APA style latest version both within the text of the report and in the bibliography. At least two bibliographic sources should be consulted.		
It presents order and cleanliness. It has good spelling and punctuation.		
Shows collaborative attitude respect to others and the environment, does not take unnecessary risks nor put others at risk.		
Bibliography and annexes, if necessary.		
<b>Subtotals</b>		

<b>Total</b>		
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**Rubrics for Individual or group presentations assigned by the professor or based on personal interest.**

The students, either individually or in groups, will make oral presentations accompanied by a written report of assigned questions. The idea is that these presentations not only provide answers but also serve as basis for discussion and broaden the scope of the subject being discussed. The report does not have to go much further than the presentation but in essence reproduces the presentation.

Excellent 4 pts	Very good 3 pts	Sufficient 2 pts	Insufficient 1 pt
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<b>Rubrics for oral presentations</b>		
Indicator	Grade	Observations
The presentation uses Powerpoint or similar program.		
The slides of the presentation follows advice on good presentations: contrasting color of letters and background, letter size is visible to all places of the audience.		
Each slide is not overfilled with information, but uses keywords to point out import facts. The graphs and charts are properly labeled including axis and other pertinent information that are part of them.		
Oral presentation. The speaker does not just read the contents of the slide but uses keywords in the slide to develop the subject and expand on explanations.		

<p>If possible, the speaker moves around trying to address all parts of the audience with his sight. It is better if the speaker does not rush through nor delay unnecessarily.</p>		
<p>At the end of the presentation the speaker should entertain questions or engage in a discussion.</p>		
<p>Organization Header: includes a slide with the names of the University, the student or students, the course and title of the presentation. The presentation itself must be structured according to sections: Introduction, Objectives, Scientific Facts, Analysis, Recommendations, Importance and Bibliography.</p>		
<p>The introduction provides a general idea of the content of the presentation.</p>		
<p>The objectives or questions to be answered in the presentation.</p>		
<p>The scientific facts is a list of facts that should be considered to answer the question</p>		
<p>The analysis is an integrated discussion of all facts to solve or answer the question. It could also include doubts, shady areas or limitations that may remain.</p>		

Recommendation is a perspective on further studies that broaden the scope of the subject being studied.		
Importance is a personal appraisal of the importance of the subject matters plays in our life		
Bibliography and annexes, if necessary.		
Subtotals		
Total		

Excellent 4 pts	Very good 3 pts	Sufficient 2 pts	Insufficient 1 pt
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<b>Rubric for Demonstration Reports</b>		
Indicator	Grade s	Observation s
The report includes a header with the name of the University, the student, and the course, title of the demonstration and a line that separates the header from the rest of the work. Organization (Report structured according to sections): Summary, Equipment, Materials, Objectives, Observations, Analysis and Conclusions Perspectives, Bibliography and annexes, if necessary.		
The summary provides brief a description of the demonstration.		
Equipment used is included as a list of apparatus, thermometers, and other materials that were used in the demonstration		
Materials is a list with all the relevant materials used in the demonstration		
Objectives state the general and/or specific objectives of the demonstration		
Observations are included as a list of all scientific facts that were observed or measurements made during the demonstration.		



Analysis and Conclusions: This is an integrated discussion of all facts and measurements that combine to produce the results that the demonstration illustrates. It could also include limitations or shady areas remaining.		
Perspectives is a section to suggest other areas where the techniques or methods illustrated in the demonstration, would be important.		
Bibliography and annexes, if necessary.		
Subtotals		
Total		

### **References and Complimentary Bibliography**

The course will required that students look for internet sources and, by comparing and analyzing, arrive at reliable sources of information. Khan Academy at <https://www.khanacademy.org/science> is a very trustworthy source for Chemistry Physics and science, in general. It also provides reliable information in Mathematics and Engineering. Wikipedia, and other free encyclopedias could be used as first approach. A number of universities offer free on-line courses that could be of help, most of them required that the student register, examples are <https://www.edx.org/course/science-cooking-from-haute-cuisine-to-soft-matter-science-chemistry> and <https://www.class-central.com/university/stanford>.

There is however a text in the following ebsohost address that can be used to study or broaden the scope of the class material.

In general, students should use APA citation structure: author name, (year, month, publication date), "Article name", retrieved from URL. For example:

[Karukstic, Kerry K; Van Hecke, Gerald R, \(2003\), retrieved from http://search.ebscohost.com/login.aspx?authtype=ip,custuid&custid=s5363422](http://search.ebscohost.com/login.aspx?authtype=ip,custuid&custid=s5363422)

Wikipedia and other encyclopedias can be cited as keyword followed by: Retrieved from URL. Example: Temperature, Retrieve from <https://en.wikipedia.org/wiki/Thermometer>

## Chronogram

Through all sessions students will be exposed to different situations that will build their competencies, such as learning to learn, develop and execute teamwork, propose scientific explanations and others, as described in the table of Competencies / Key competencies / Evidence of learning. However in the table that follows an attempt is made to assign specific Sub-competencies and Key competencies to particular sessions, with the understanding that some competencies, as mentioned above, are not acquired in a single session but are the result of a building process.

<b>Week</b>	<b>Subcompetency/Key competency</b>	<b>Contents</b>	<b>Teaching strategies</b>
1	Identifies reliable sources of information	Introduction to PCHEM (Start)	Course description and class discussion
2	Observes daily ordinary PChem facts following systematic scientific procedures of observation.	Introduction to PCHEM (End)  Synthetic and natural materials (Start)	Prof presentation: The distinction between Chemistry and Physics follow up in-class discussion
3	Discusses PChem finding according to scientific standards.	Synthetic and natural materials (End)	First demonstration and follow up discussion
4	Communicates scientific facts orally and in written form.	Wave phenomena (Start)	Prof presentation: and follow up discussion. Students presentations
5	Learn to learn and executes team work	Wave phenomena (End)	Students presentations
6	Executes teamwork and develops leadership.	Energy Issues (Start)	Prof presentation and follow up discussion Students presentations
7	Proposes scientific explanations to daily PChem facts by deduction or synthetic thinking	Energy Issues (End)	Students presentations
8	Observes landscapes and identifies environmental issues	Environment (Start)	In-class discussion.
9	Proposes scientific solutions to environmental issues	Environment (End)	In-class discussion. First field trip report.

10	Proposes solutions to subject matters that were not part of the course but are important to the student personally	Biochemistry and Biophysics (Start)	In-class discussion Second field trip report.
11	Proposes solutions to subject matters that were not part of the course but are important to the student personally	Biochemistry and Biophysics (End)	Students presentations and discussion
12	Integrates knowledge, skills and attitudes to learn continuously and through one's life pursuing an efficient development in the knowledge-based society.		Students presentations and discussions