

SCILABO101, Introductory Science Laboratory
Fall 2019



dr. R.D. van der Weijden, Associate Professor UCR

**SCILABO101, Introductory Science Laboratory
Fall 2019**

Classroom no: L026
HZ University of Applied Sciences
Edisonweg 4
4382NW Vlissingen
Telephone: 0118-489000
www.hz.nl

Class times: Wednesday 09.00-17.00

Instructor: dr. R. (Renata) D. van der Weijden

Teaching assistant: M. (Reza) Hosseinzadeh

Email: r.vanderweijden@ucr.nl

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Office no. & location: Eleanor 2.02

Office hours: By email appointment

HZ WIFI: Use Eduroam or use Free WIFI number available on screen in HZ Library

I. Track information

- a. Prerequisites for this course: You need to have had 3 years of chemistry in high school. Computer skills using Excel and Word are highly desirable for data analysis and writing lab reports, but a brief introduction to using Excel can be given on request.
- b. This course serves as prerequisite for: Advanced Science Laboratory (SCILABO301) and Life Science Laboratory (SCILABO201).
- c. Other courses which are relevant to this course – e.g. as part of a minor: pre-medical track courses, Science courses like Ecology, Chemistry and Earth Science.

For further information about the track, please see the track document available on the UCR intranet or under uploaded files for this course.

II. Course description

III. Study Load

This course earns students four credits (equivalent to 7.5 ECTS). The class meets on Wednesdays an entire (or half a day). Preparation time is approximately 3-4 hours per week; reporting 4 hours a week, on average.

IV. Course materials

- a) Supporting books and literature:
 - a. More JT (2010) *Chemistry Essentials for Dummies*, Wiley Publishing, Inc., Hoboken.
 - b. Pitzer EW (2014) *Introductory Chemistry*, Bookboon.com.
 - c. <http://philschatz.com/chemistry-book/contents/m50979.html>
- b) SCILABO101 Protocol uploads
- c) Any other supporting information is presented on Moodle.
- d) Chemical safety webpage: Material Safety Data Sheets:
<http://www.msdsearchengine.com/>

V. Course organization and requirements

- a) Special needs: students with documented learning disabilities or special needs should make their needs known to the instructor at the start of the course.
- b) Two students, in shifts, will arrive 30 minutes in advance to set up and prepare for class. The same couple of students will stay to direct their fellow students to store materials and inspect if cleaning has been properly done after the lab session.

NOTE: see Table under 2. further down where the team in yellow is to come in 30 min early.

- c) Experimental procedures and readings need to be printed out by the students themselves.
- d) Class meetings can encompass prelab assessment, short lectures, experimental work, student presentations, discussion of group/individual work and in-class assignments. An average lab-day may be similar to the one in the table below:

8:30 -9:00	Setting up of materials/equipment by team of two students
9:00 – 9.15	Prelab assessment (multiple choice)
9:15 - 9:45	Introduction to the experiment/calculations
9:45-10:45	Experimental work
10:45-11:00	Coffee break
11:00-12:30	Experimental work
12.30-13.15	Lunch
13:15-16:40	Experimental work
15:15-15:30	Tea break
16:40-16:55	Cleaning up
17:00	Leaving the lab after consent of Instructors and team of students

- e) It is essential that you prepare for class: read the assigned literature, make dilution schemes ahead of time, perform calculations (for instance on how much solids to weigh). Also perform the homework assignments.
- f) In case of evident lack of appropriate laboratory preparation, for safety reasons, you can be expelled from the practical and the session has to be done individually on another date after the end of the semester. You will need to apply for a course extension as well.
- g) Use Moodle for submitting work. Reports should be in either Word or Excel format (no pdf) to facilitate feedback. All reports should have a straightforward name, for example: NAME_Assignment number (Dorothy_report1.doc or Daniel_report1.xls).
- h) Deadlines for individual or group work are to be met. Missing deadlines means grade deduction 4%/day, max of 10 workdays (because later is an automatic fail, also % wise).
- i) If you hand in the report after 10 days, you will need permission of the instructor to submit the report for grading. Lab reports handed in after an extension date (after 10 days *plus* the additional days allowed by the instructor) will not be accepted and a score of Zero will be assigned. This is to protect students from failing the course by not handing in homework.
- j) Plagiarism is a serious academic offence which carries heavy sanctions. Acquaint yourself with the UCR Plagiarism Policy (see Student Handbook).
- k) Repeated lateness (more than 5 min) may affect your grade or being expelled from the course: you work in a team most of the time!
- l) Absenteeism needs to be communicated in advance whenever possible (email/text message on phone instructor). You can only make up for a missed class after the end of the semester. You will need to apply for a course extension.
- m) You cannot hand in a report for a lab session where you were not present.
- n) Missing an exam without prior communication means scoring 0%. If you miss an exam for valid reasons, you will be offered the opportunity to do the exam on the day of the practical exam.
- o) Not attending the COVRA excursion will affect your lab performance grade.
- p) According to institutional guidelines, two missed lab sessions (equivalent to 8 missed classes) means you cannot pass, even if this is due to illness.
- q) You should apply to the following basic lab rules:
 - a. Wear lab glasses and clothing according to HZ lab rules at all times. Do not wear a labcoat outside the laboratory facilities.
 - b. Always mark with a permanent black marker which chemicals are present in glassware or other containers.
 - c. If you weigh a chemical, do not return surplus to containers, in order to avoid contamination of the stock.
 - d. If you need liquid from a container/bottle always pour it into a beaker glass first and do not pipette from the container/bottle, in order to assure purity of the stock.
 - e. Cleaning up is mandatory! Always make sure that:
 - i. chemicals and materials are placed back in the proper place.

- ii. nothing is left by the sink, in the fume-hood or around the analytical balances.
 - iii. pH electrodes are stored in wet jackets and pipettes in their boxes.
 - iv. glass-ware is cleaned (marker removed) and put back in the cabinets.
 - v. chemical containers (flasks, boxes) are clean on the outside when placed back.
- f. You are not allowed to leave the lab course early without approval of the instructors.

This course is subject to UCR academic rules and procedures. Both students and instructors are required to know and follow these rules and procedures.

VI. Assessment

- a) Participation in Initial Written Test: 1%
- b) Written Exam: 10%
- c) Practical Exam: 15%
- d) Short Data Reports/Data sheets (6x) 5% each
(unless number of data reports is reduced)
[1: pH-Acidrain 2: UV-VIS 3: FAAS-Fe in Hemoglobine
4: Galvanic Cells 5: GC and IC alcohol and sulfate analysis 6: ISE Fluoride]
- e) Lab Reports (2x): 7%
[1: Aspirin 2: Winkler titration]
- f) Scientific Report (1x): 10%
[Fermentation (if successful, include HPLC sugar)]
- g) Laboratory performance-lab journaling 10%
- h) Prelab homework multiple choice test: 10%

a. Initial Written Test:

Test on day 1, to verify your current knowledge of chemistry and basic calculations.

b. Written Exam:

Test concerning essential laboratory calculations and procedures.

c. Practical exam:

Designing the experimental procedure, carrying out and data processing of an individual experiment. Draft versions of the experimental procedure will not be graded, but may benefit from feedback.

d.e.f. Data reports, Lab reports, Scientific reports (and oral presentations):

Reporting/presenting of performed experiments. On occasion, reports may be written together with lab a partner. Deadline: In general, all reports should be handed in the following week after last practical: Wednesday's at 24.00 hour, latest (except for the

scientific report, as mentioned below). Late uploaded reports are subject to grade deduction as indicated above and below.

- **Short Data report (team of 2):** Summary of safety considerations, observations, result reporting data analysis, error analysis and discussion of reliability, conclusion.
- **Lab report (team of 2):** Report in Journal style including: section 1: Abstract (Summary of the aim of the experiment, method and main result) section 2: Methods (including safety measures) and Materials section 3: Results and data analysis section 4: Discussion section 5: Conclusion, If applicable, also include references, appendices.
- **Scientific report (individual):** Complete article style report. The article style report should include literature research on the subject. The scientific report should be written individually.

g. Laboratory performance:

Safe working, cleaning-up behavior, choosing the appropriate equipment (glass-ware, balances).

Keeping a clear and concise labjournal. Participation in COVRA excursion.

h. Prelab homework:

Based on the delivered answers on the prelab multiple choice test students will be further questioned on safety issues and experimental preparations*. Hints:

- Consult Material Safety Data Sheets (MSDS).
- Think about how to handle and dispose the chemicals in a safe and environmental friendly way.
- Find background information on the applied analytical technique. For instance, when working with the spectrophotometer, be aware of the analytical wavelength, understand the principle of absorption of light, practice using the law of Lambert Beer etc.
- Study the basic chemistry in the experiment, the reactions and products.
- Calculate how solutions or mixtures should be made.
- Make a dilution scheme for the standard solution series from a known stock solution.
- Read through the experimental steps to see if there should be parallel actions taken and which materials (such as glassware/solutions) need to be ready at which moment.

In conclusion, you will be involved in the following activities that will be evaluated:

- Preparation.
- Literature search.
- Laboratory performance.
- Reporting.
- Designing an experimental procedure.

- Data analysis (you will receive a computer account at the HZ University of Applied Sciences).
- A (mid)term written exam based on performed experiments and theory.
- An end-term individual practical exam.
- An excursion to COVRA, the radioactive waste processing and storage facility

VII. Course schedule (subject to change depending on progress and access to lab equipment)

Time	Topics to be discussed	Assignments and assessment
August 28 th	Introduction: <ul style="list-style-type: none"> - Course manual explanation. - Practice chemical calculations. - Lab-coat and glasses purchase. - Lab-tour. - Laboratory Fire drill. 	Initial Assessment on knowledge of high school chemistry. You can consult the online books. This is not for a grade, participation will let you earn 1%
Sept 11 th <i>(note: since there are YESC activities, the plan may change)</i>	Experiments: <p>pH</p> <ul style="list-style-type: none"> - pH meter calibration - pH measurements - pH buffering - Reactions with simulated acid rain <p>UV-VIS Spectroscopy (UV-VIS):</p> <ul style="list-style-type: none"> - Using laboratory glassware, balances and automatic pipettes. - Making of calibration series. - Calibration of spectrophotometer with K_2CrO_4. 	Experiment preparation: <p>Read the uploaded protocols Reading material if uploaded Prelab assessment questions</p>
Sept 18 th		<i>Hand in Short Data Report/Sheet 1&2 (5% each)</i>
Sept 25 th	Experiments: <p>Aspirin synthesis</p> <ul style="list-style-type: none"> - Recovery (production) efficiency - Purity/recrystallization - Crystal morphology examination 	Experiment preparation: <p>Read the uploaded protocols Reading material if uploaded Prelab assessment questions</p> <p>NOTE: BRING AN ID FOR COVRA SIGNUP</p>

Oct 2 nd		<i>Hand in Lab Report 1 (7%)</i>
Oct 9 th	<p>Experiments:</p> <p>Flame Atomic Absorption Spectroscopy (FAAS)</p> <ul style="list-style-type: none"> - Iron in Hemoglobine <p>Electrochemistry:</p> <ul style="list-style-type: none"> - Galvanic cells OR HF cars <p>Prepare fermentation bottles</p>	<p>Experiment preparation:</p> <p>Read the uploaded protocols</p> <p>Reading material if uploaded</p> <p>Prelab assessment questions</p>
Oct 23 rd		<i>Hand in Short Data Report/sheet 3&4 (5% each)</i>
Oct 30 th	<p>Experiments:</p> <p>Fermentation analysis with chromatographic methods:</p> <p>Chromatography</p> <ul style="list-style-type: none"> - Gas Chromatography: alcohol fermentation - High Performance Liquid Chromatography: sugar - Ion Chromatography: Sulfite (as sulfate) 	<p>Experiment preparation:</p> <p>Read the uploaded protocols</p> <p>Reading material if uploaded</p> <p>Prelab assessment questions</p>
Nov 6 th	<p>Written exam (morning at UCR)</p> <p>COVRA excursion</p> <ul style="list-style-type: none"> - Leave from UCR at 12:20 - Return at UCR before 17:00 	Written Exam
Nov 20 th		<i>Hand in Short Data Report/sheet 5 (5%)</i>
Nov 27 th	<p>Experiments:</p> <p>Redox Titration:</p> <ul style="list-style-type: none"> - Oxygen (“Winkler”). <p>Ion Selective Electrodes (ISE):</p> <ul style="list-style-type: none"> - Fluoride in mouthwash (standard addition method) 	<p>Experiment preparation:</p> <p>Read the uploaded protocols</p> <p>Reading material if uploaded</p> <p>Prelab assessment questions</p>
Dec 4 th		<p><i>Hand in Short Data Report/sheet 6 (5%) and submit draft protocol exam</i></p> <p><i>Hand in Lab Report 2 (7%)</i></p>
Dec 4 th afternoon	Make copper calibration series	

Dec 11 th		Hand in Scientific Report (10%)
Dec 11 th afternoon	Practical Exam	Assessment of Lab journal (10%) Practical exam (15%): includes hand-in of final protocol and data sheet

VIII. Student learning outcomes

More detailed objectives (to be used when studying for exam) will be put on Workspaces!

Period	Teaching activities	Student is able to do
Week 1-2	Practice chemical calculations and making measurements of mass and volume using the appropriate balance and automatic pipettes.	Make appropriate use of laboratory balances, glassware and automatic pipettes. Check whether work is performed accurately and precisely.
Week 2-9	The preparation, performing and reporting of a laboratory experiment. On a weekly basis the reporting requirements will be intensified. The last week, the experimental procedure has to be designed, carried out and the data processed, individually. Flame Atomic Absorption Spectroscopy (FAAS), Ion Selective Electrodes (ISE), Ion Chromatography (IC):	Make appropriate use of different laboratory equipment and apply basic analysis methodologies. Work safely and precisely, and make experimental observations. Process, report and present data properly. Read and review scientific literature. Make a basic experimental design.

IX. Appendices

1. Financial Contribution:

Since the laboratory course is the most expensive course at UCR, a financial contribution is required:

- Chemicals, lab-material etc.: €43
- lab-glasses: €12
- lab-coat: €20

You can either pay by cash or by bank-transfer:

NL12 RABO 0335 0483 15
University College Roosevelt
Mention: Contribution SCILABO101

Naturally, if you have your own lab-coat or lab-glasses, you don't have to buy new ones.

For each lab session you need to bring a lab-journal (bound), a black marker (permanent) and a calculator. You can buy the first two items mentioned at the HZ bookstore, if needed.

2. Group I Layout*

Sept 11 th	Sept 25 th	Oct 9 th	Oct 30 th	Nov 27 th	Dec 4 th
Thibaud Borja	Borja Sophia	Borja Chiara	Eva Sophia	Sophia Famke	Dana Thibaud
Sophia Chiara	Thibaud Chiara	Dana Maria	Maria Chiara	Thibaud Maria	Maxim Chiara
Maxim Dana	Famke Maxim	Emma Famke	Emma Borja	Maxim Borja	Eva Sophia
Famke Maria	Emma Maria	Thibaud Sophia	Famke Dana	Dana Eva	Maria Borja
Eva Emma	Eva Dana	Maxim Eva	Maxim Thibaud	Chiara Emma	Emma Maria

*: at some sessions work is done individually.

3. Safety Rules at HZ University of Applied Sciences.

IN CASE OF AN INCIDENT OR ACCIDENT IN THE LAB:

- a. Notify Instructor.
- b. When Instructor is not present (or unable to respond) notify Laboratory Head: Sandra de Reu.
- c. When neither the instructor nor Laboratory Head is available call:

9 7 7 7

IN CASE OF A FIRE/EXPLOSION:

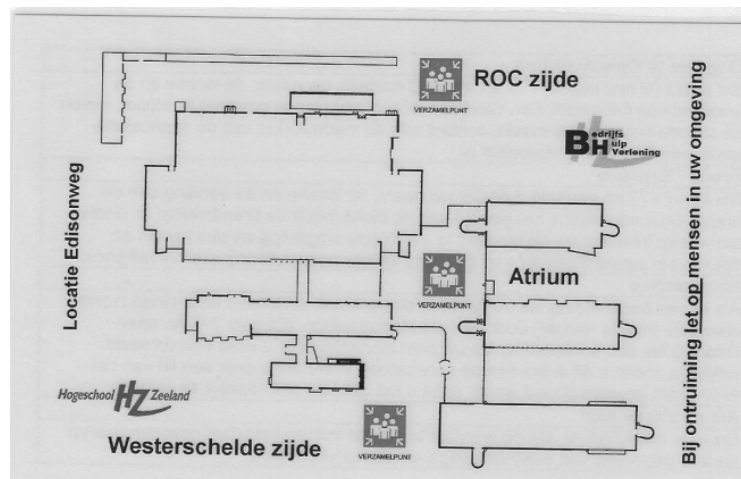
1. Notify Instructor if possible and/or push the fire alarm button.
2. Call:

9 7 7 7

3. Try to extinguish beginning fires (training provided).
4. If necessary shut down electricity using big red knob on the left side of the door.
5. Close doors and windows.
6. Use escape route (do not use elevators).
7. Gather at designated meeting point outside the HZ building (ATRIUM).

IN CASE THE SIREN SOUNDS:

Gather outside at the ATRIUM



B	Rules of conduct for practicals
B1	General rules of conduct for the practicals
1	Order and neatness are required to work safely. For each practical two students will be appointed labwatch to assist in keeping order and neatness.
2	Smoking, drinking and eating is not allowed in the laboratory. Always wash hands before leaving the laboratory or when appropriate (e.g. chemicals on hands)
3	The student needs to know the escape routes to leave the building in case of an alarm. Also, the gathering place where he needs to report after leaving the building needs to be known and fled to. The instructor or supervisor needs to do a headcount here. The gathering place is at the so-called 'plofhok'.
4	At the start of a practical the student needs to sign the attendance list. When a student needs to temporarily leave the laboratory, he needs to report this to the instructor or the labwatch student. At the end of the practical the lab journal needs to be signed by the instructor.
5	For every experiment, a proper preparation of the students regarding safety and experimental procedure is mandatory.
6	The student needs inform himself or herself about the potential dangers of a certain experiment. When in doubt always consult an instructor.
7	The student must report defects of apparatus immediately to the instructor.
8	The student must wear safety glasses at all times in the laboratory and a buttoned up lab coat, proper shoes (no sandals, high heeled pumps etc.). It is not allowed to wear shorts or short skirts for safety reasons. Pants are preferred.
9	No caps, hats, shawls or other should cover the head, yet loose long hair must be tied with an elastic, hairclip etc. Garments such as ties, shawls are prohibited. Clothing worn for religious purposes must adhere to standard safety rules (contact instructors).
10	Pipetting of fluids may only be done by using the pipette balloon, not with the mouth!!!
11	Waste that is hazardous for the environment may not be flushed down the sink but must be disposed of in the appropriate waste containers.
12	The student may not stay in the laboratory without supervision of an instructor or assistant.
13	The student may not skip a practical. When the student is absent for relevant reasons, he must report this to the administration of education and needs to contact the instructor on how to catch up with the practicals.
14	The student needs to hand in the lab reports in time. If reports such as safety reports and reports on experimental procedures are not handed in in time, the instructor may deny the student entry to the lab.
15	The use of a lab journal is mandatory
16	The instructor appoints one or two students as lab watch. This student has the following tasks - Checks if the attendance list has been signed by all students - Checks is all the chemicals have been put back into place

	<ul style="list-style-type: none"> - Checks if the used apparatus is turned off - Checks whether the lab counters, sinks, weighing tables and equipment and hoods are cleaned properly <p>The lab watch reports to the instructor at the end of the practical</p>
17	Do not write on your lab coat or decorate it otherwise. You are allowed to put your name in the lab coat if it is your personal property.
18	It is not allowed to carry or use walkmans, mobile phones or other distracting things in the laboratory

B2	Additional rules of conduct for microbiological practicals
1	Below follow the specific rules of conduct that apply to microbiological experimentation.
2	Wear a buttoned up lab coat; sleeves from a shirt or sweater may not come from under the lab coat sleeves.
3	Keep your nails, short; take off watch and rings.
4	Always work above a lab bench; in case you spill the infection will be contained to the table. Place as few pens and papers as possible on the bench. Never work right above your manual or lab journal.
5	Keep all tubes, nutrient media etc. that are used for growing bacteria closed as much as possible. The same holds for tubes, nutrient media etc. that are infected with bacteria.
6	Walk as little as possible with infected material through the laboratory. Infected materials may never leave the laboratory.
7	<p>No infected material may be thoughtlessly cleaned or discarded.</p> <ul style="list-style-type: none"> - Small infected disposables – like papers, cotton wads, slides, Pasteur pipettes etc. – must be submersed in the trays with disinfecting liquid (which are located on top of the lab benches). - Larger infected disposables – like overgrown Petri dishes etc – must be placed in a special waste basket which is lined with a double plastic bag. - Infected test tubes are collected in a special metal basket. - Infected pipettes are first placed in the containers with disinfecting liquid located on the lab benches. At the end of the practical, they are moved to the centrally located pipette cylinder also containing disinfecting liquid.
8	<ul style="list-style-type: none"> - Infected glass that needs to be reused – like Erlenmeyer flasks, measuring cylinders etc. – are submersed in a centrally located large container with disinfecting liquid. - Non-infected materials may be cleaned or disposed of in the usual way.
9	Pipetting of fluids may never be done by mouth. If you use a the pipette balloon to pipette infected material, only remove the balloon of the pipette once the tip of the pipette is in the disinfecting liquid. To pipette small volumes, use a special pipette with a disposable sterile plastic tip.
10	<p>When an infection occurs – for example because of a falling tube containing cultures, accidentally opened Petri dishes, leaking pipettes etc. – immediately take the appropriate disinfecting measures, like cleaning the infect place with disinfecting liquid.</p> <p>Avoid infecting yourself and others. In case of accident warn your instructor!</p>
	At the end of the practical, sprinkle the lab benches with disinfecting liquid and distributed it with cotton wool or

11	paper towels of the benches.
12	Take of your lab coat before you leave the laboratory. Then wash your hands with special disinfecting soap; dry your hands with a paper towel. Only then put back on your watch and rings.
13	An infected lab coat should be taken off very carefully, folded up inside out, and transported in a plastic bag. Wash it separately (hot!).