

**ONLINE COURSE:
“GOOD CHEMISTRY - METHODOLOGICAL,
ETHICAL, AND SOCIAL DIMENSIONS”**

ECC7, GENERAL ASSEMBLY, LIVERPOOL
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Dr. Jan Mehlich
EuChemS Working Party on Ethics in Chemistry

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 - Hartmut Frank
 - Luigi Campanella
 - Jan Mehlich

What is the goal?

- „Sustainable education of chemistry students as our future scientists and researchers“
- Goals:
 - Good Scientific Practice, Scientific Integrity;
 - Responsible professional conduct in academia, industry, or public service;
 - Awareness of dual-use potentials and how to deal with it;
 - Improving discourse skills.
- Therefore, a proper course needs sections on:
 - Scientific methodology;
 - Research ethics;
 - Social impact of chemistry.

Research Methodology

Science
Theory

Science
History

Scientific
Method

Logic

Limits of science

Scientific statements

Science under uncertainty

Good Scientific Practice

Experimentation
Measurement

Conflicts of
Interest

Scientific
Misconduct

Fabrication of data

Falsification of data

Plagiarism

Funding and
academic freedom

Intellectual
Property

Scientific
Publishing

Mentorship

Animal experiments

Chemistry and Society

Risk

Precaution

S&T Discourse

Science Communication

Public discourse

S&T Governance

Technology Assessment

Responsibility

Sustainability

Why bother?

- Knowledge and awareness of the normative dimensions of chemistry pays off in the form of:
 - Professional skill and competence
 - Credibility
 - Societal support
 - Sustainable progress
 - Economic benefit

- Online Course, provided via e-learning platform Moodle
- Target group: Master (final year) and PhD (early phase) students.
- 16 classes:
 - 45-60 min. video lecture;
 - Pre-assessment questions, warm-up reflections;
 - Chemical cases (historical, fictional);
 - Reading and discussion assignments;
 - Workshops and forums;
 - Quizzes (test questions for assessment of learning outcome).
- Estimated workload per class: 2-3 hours
- Great organisational flexibility:
 - Entire course = 2 ECTS; selection of 8-10 classes = 1 ECTS
 - Local instructors manage and adapt the course content on Moodle, or combine it with on-site (face-to-face) classes.

Course Outline

1	Introduction	
2	Scientific Inquiry	
3	The Scientific Method(s)	
4	Scientific Practice	
5	Scientific Misconduct	
6	Scientific Publishing	
7	Collaborations, Conflicts of Interest, Mentorship	
8	Academic Freedom, Intellectual Property	
9	Animal Experiments	
10	Sustainability	
11	Science and values	
12	Responsibility	
13	Risk, Uncertainty, Precaution	
14	Science Governance, Technology Assessment	
15	Science Communication	
16	Example: Nanoscience	


Example

Class No.	Class Title
10	Sustainability

Summary of content
With this class, we start another section of this course: The impact of chemistry onto society and the environment. Here, the normative framework in the form of an ethos of science that has been used in previous classes is not sufficient. We will explicit a concept that served as a normative orientation

Good Chemistry

 Participants


 Badges

 Competencies

 Grades

 General

 Class 1 - Introduction

 Class 2 - Scientific

Class 10 - Sustainability

-  01 - Warm-up: My own research project and sustainability
-  02 - Reading assignment: Sustainable and Green Chemistry (Albini, Protti)
-  03, 05, 07 - Video class: 10 - Sustainability
-  03, 05, 07 - Lecture Script
-  04 - Background information: Chemical Leasing
-  06 - Reading Material: REACH and Sustainability (ECHA report 2017)
-  08 - Discussion forum: Chemistry & Sustainability
-  09 - Quiz

1	Warm-up reflection: My own research project and sustainability	10 min.
2	Reading assignment: Sustainable and Green Chemistry (Albini, Protti 2016, read only chapter 1, the rest is optional)	15 min.
3	Watch the video, 0:00-32:55	33 min.
4	Further information: Chemical leasing (youtube video)	10 min.
5	Watch the video, 32:56-36:56	4 min.
6	Reading material: REACH and sustainability (read only chapter 2 of the provided report, the rest is optional)	20 min.
7	Watch video, 36:56-end	10 min.
8	Discussion/reflection: Chemistry and Sustainability	15 min.
9	Quiz	5 min.

Course Objectives

- Understanding basic science theory and applying it in daily research activity,
- Increasing knowledge on theory, conduct and communication of chemical science,
- Applying ethics to *scientific practice* and *science assessment*,
- Learning concepts of *responsibility* and *sustainability* in the context of chemistry,
- Acquiring skills for interdisciplinary normative discourse.

**THANK YOU FOR YOUR INTEREST
AND ATTENTION!**