

CIVIL-608

**Research skills in the Open Science Era**

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Cursus	Sem.	Type
Civil & Environmental Engineering		Opt.

Language of teaching	English
Credits	2
Session	
Exam	Project report
Workload	60h
<b>Hours</b>	<b>56</b>
Lecture	26
Practical work	16
Project	14
<b>Number of positions</b>	<b>15</b>

**Frequency**

Every year

**Remark**

Next time: Spring 2025, Max 15 participants. These credits count towards the transversal skills credits

**Summary**

Research Skills in the Open Science Era is a course designed to explore the landscape of modern research tools and practices. You will gain insights into principles of open science, smart information retrieval, ethical publishing, coding best practices, and comprehensive research data management.

**Content**

Sem.1 - Intro &amp; General

- Principles of research
- Research in Engineering
- Research outputs
- Peer review process
- Reproducibility in research
- FAIR principles

Sem. 2-6 - Information literacy &amp; Smart publishing

**Searching for information**

- Theoretical bases: scientific information as a network, elementary information retrieval, search equation
- Overview of information sources: articles, books, patents, reports, theses, databases, search engines...
- IA in research: concepts and tools
- > [TP/exercise]/examples: Building a search equation, choosing the right tool, using IA wisely
- â#â Copyright, plagiarism & citation
- Intellectual property basics: copyright laws, patents
- Citation best practices: citation as prevention against plagiarism
- Reusing otherâ##s content: tables, images, illustrations...
- > [TP/exercise/examples]: Real-life cases of citation/reuse of content
- â#â Publication and Open Access
- The evolving ecosystem of scientific information: Open Access, publishing agreements, institutional and funders policies, authorship
- Visibility and impact: introduction to bibliometrics and altmetrics
- Collaborative writing: Overleaf, Authorea
- > [TP/exercise/examples]: monOApoly, (OA serious game) collaborative writing examples

Sem. 7-10 - Coding for research

â#â Coding good practices in the Open-source Era

- Software introduction, programming languages
- Open-source & business models
- Code style and tools (e.g. linters)
- Version control, Collaborative coding and code publishing
- Collaborative coding and code publishing (release, packaging, code reviews)
- Citing software (software heritage)
- Documentation (e.g. md, readme, doc automation)
- > [TP/exercise/examples]: Git, docker
- â#ª Data visualization / Scientific figures
- Theory of design principles
- Graphical integrity
- Type of plots
- Sem. 11-14 - Research Data Management
- â#ª RDM Good practices in the Open Research Data era
- FAIR data principles
- Research data lifecycle: from raw data to data publication, including processed data and associated software and code
- Metadata, interoperability, machine-readable
- Standards in civil/environmental engineering
- Data protections laws
- > [TP/exercise/examples]: Re-use published data
- Access and re-use content from data repositories
- Data management plan
- Discover metadata for research data
- RDM process workflow
- â#ª â##Hot dataâ##: sharing & storage
- â#ª â##Cold dataâ##: publishing & archiving
- > [TP/exercise/examples]: Cloud storage solutions
- Data organization, file naming and documentation
- ABC of data protection
- Publish data on Zenodo and other data repositories (e.g. Envidat)
- Differences bw GitHub vs Zenodo
- Distinguish storage, back-up and preservation solutions

## Keywords

Bibliographic databases, Smart publishing, Search strategies, RDM, Data, Dataset, Software, Code, FAIR Data Principles, Plagiarism, Scientific publishing, Copyright

## Learning Outcomes

By the end of the course, the student must be able to:

- Develop the appropriate skills to support Open Science compliant dissemination and re-use of scientific output
- Formulate a search strategy for his/her own PhD output (tool selection, search query design, literature monitoring)
- Determine the consequences of intellectual property laws in the re-use of scientific information and content
- Design Open-Source compliant software to be used in research
- Identify and apply RDM good practices and FAIR principles

## Transversal skills

- Collect data.

## Resources

### Moodle Link

- <https://go.epfl.ch/CIVIL-608>