Building design in the circular economy

Fivet Corentin

<table>
<thead>
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<th>Cursus</th>
<th>Sem.</th>
<th>Type</th>
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<tbody>
<tr>
<td>Architecture</td>
<td>MA1, MA3</td>
<td>Opt.</td>
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<td>Minor in Engineering for sustainability</td>
<td>H</td>
<td>Opt.</td>
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<td>Territories in transformation and climate minor</td>
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Contact language: English
Credits: 3
Session: Winter
Semester: Fall
Exam: Written
Workload: 90h
Weeks: 12
Hours: 2 weekly
Lecture: 2 weekly
Number of positions: 2

Remark
Cours donné les années impaires

Summary
The class introduces the concept of circular economy and its applications to building design, with a focus on design with reused components, design for disassembly, and life-cycle assessment. The class develops critical thinking skills over and above theoretical and technical inputs.

Content
Circular economy consists in maintaining and/or improving the value of products as long as possible, i.e. by extending or renewing their service live while minimizing resource depletion, waste generation, and greenhouse gas emissions. When it comes to building design, a series of sometimes contradicting strategies emerges: to limit the quantity of used materials, to limit their ecological impact, to enhance the versatility of buildings, and to ensure the future repair, reuse, or recycling of their components. The class delves into recent literature and practice, aiming at providing the necessary expertise to adopt these strategies in a pragmatic state of mind.

The following themes punctuate the semester:
• Environmental Footprint of Buildings: Situation & Assessment Methods
• Circular Economy (& Industrial Ecology): History, Principles, and Expectations
• Building Use: Density & Versatility
• Low-Impact Materials & Material-Efficient Systems
• Recycling & In-Situ Improvement
• Material Sourcing & Stewardship
• Design for Upstream Reuse
• Design for Downstream Reuse (Design for Disassembly, Reversible Design)
• Restorative and Regenerative Design

Keywords
Circular Economy; Industrial Ecology; Reuse; Open Building; Regenerative Design; Product Stewardship; Material Passport; Urban Mining; Dematerialization; Depollution; Design-for-disassembly; Modularity; Reversibility; Recycling; Upcycling; Cradle-to-Cradle; Technical & Biological Cycles; Ecological Footprint; Social Ecology; Carbon Emissions; Waste Production & Management; Material Depletion; Urban Metabolism; Refurbishment; Building Management

Learning Prerequisites
Required courses
Learning Outcomes
By the end of the course, the student must be able to:
• Develop a critical mindset towards design theories and strategies for bettering the ecological footprint of buildings;
• Integrate design principles for building versatility, disassembly, and reuse;
• Synthesize a critical and nuanced opinion in written and oral forms;
• Recall the principles, methods, and references discussed in class;
• Assess / Evaluate the principles, methods, and references discussed in class.

Transversal skills
• Plan and carry out activities in a way which makes optimal use of available time and other resources.
• Communicate effectively, being understood, including across different languages and cultures.
• Take responsibility for environmental impacts of her/ his actions and decisions.
• Demonstrate a capacity for creativity.
• Demonstrate the capacity for critical thinking
• Manage priorities.
• Summarize an article or a technical report.

Teaching methods
The course alternates flipped classrooms with traditional delivery.

Expected student activities
Students are expected to:
• attend and enliven all classroom sessions;
• prepare classroom sessions by reviewing selected texts and case studies;
• write an essay (one over the semester).

Assessment methods
Grades reflect both the student’s activities during the semester and the final examination.

Supervision
Office hours Yes
Assistants No
Forum No

Resources
Bibliography
A list of texts and case studies will be provided to the students at the beginning of the class.

Notes/Handbook
The slides presented in the classroom will be made available online.

Moodle Link
• https://go.epfl.ch/AR-497