

3.00 credits

22.5 h



Q2



**This biannual learning unit is not being organized in 2023-2024 !**

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| Teacher(s)          | Altomonte Sergio ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Language :          | French                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Place of the course | Louvain-la-Neuve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Main themes         | Starting from the principles and frameworks related to sustainable development, the module investigates the ways in which scientific research and design practice in architecture and engineering can adequately respond to current and prospected challenges – e.g. climate change, energy crises, demands for comfort, satisfaction, health and well-being in buildings – within a resilient and circular approach to architectural design.                                                                                       |
| Learning outcomes   | <p><b>At the end of this learning unit, the student is able to :</b></p> <p>1 Part A - Architecture and sustainable development - critical analysis of architecture in the sustainable development context, using written texts and examples</p> <p>Part B - Advanced special techniques: energetic design of technical installations in relation to energetic design of buildings</p>                                                                                                                                              |
| Evaluation methods  | Preparation of a synthesis article (5000-8000 words), providing a critical and prospective review of the literature and the state of the art in a field of research relevant to the course (1-2 people).                                                                                                                                                                                                                                                                                                                            |
| Teaching methods    | The course is based on ex-cathedra lectures, workshops, seminars and fieldwork.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Content             | <p>The course is articulated on the following contents:</p> <ul style="list-style-type: none"> <li>• From sustainability to resilience and circularity</li> <li>• Environmental labels and energy certificates</li> <li>• Green buildings vs. healthy buildings</li> <li>• Comfort, satisfaction, health and well-being in buildings</li> <li>• Physics vs Psychophysics: boundaries of tolerance</li> <li>• Methods and tools for environmental design and analysis</li> <li>• Research by design vs Design by research</li> </ul> |

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| <p>Bibliography</p>                | <ul style="list-style-type: none"> <li>• Altomonte, S., Allen, J., Bluysen, P.M., Brager, G., Heschong, L., Loder, A., Schiavon, S., Veitch, J.A., Wang, L., Wargocki, P. (2020). Ten questions concerning well-being in the built environment. <i>Building and Environment</i>. doi: <a href="https://doi.org/10.1016/j.buildenv.2020.106949">https://doi.org/10.1016/j.buildenv.2020.106949</a></li> <li>• Altomonte, S., Kent, M., Brager, G., Schiavon, S. (2019). Indoor environmental quality and occupant satisfaction in green-certified buildings. <i>Building Research &amp; Information</i>, 47 (3), 255-274.</li> <li>• Altomonte, S., Saadouni, S., Kent, M., Schiavon, S. (2017). Satisfaction with indoor environmental quality in BREEAM and non-BREEAM rated office buildings. <i>Architectural Science Review</i>, 60(4): 343-355.</li> <li>• Altomonte, S., Schiavon, S. (2013). Occupant satisfaction in LEED and non-LEED certified buildings. <i>Building and Environment</i>. 68, 66-76.</li> <li>• Baker, N., Steemers, K. (2002). <i>Daylight Design of Buildings</i>. Earthscan Press.</li> <li>• Cochran, W. G. (1977) <i>Sampling techniques, Wiley series in probability and mathematical statistics</i>, Third ed., Wiley, New York.</li> <li>• Daniels, K. (1998). <i>Low-Tech Light-Tech High-Tech</i>. Birkhauser: Basel.</li> <li>• DePlazes, A. (2005). <i>Constructing Architecture: Materials, Processes, Structures: A Handbook</i>, Birkhäuser: Basel.</li> <li>• Herzog, T., et al. (2008). <i>Façade Construction Manual</i>. Birkhäuser: Basel.</li> <li>• Hindrichs, D.U. (2007). <i>Plusminus 20/40 Latitude: Sustainable Building Design in Tropical and Subtropical Regions</i>. Edition Axel Menges: London.</li> <li>• Kleinbaum, D. G., Kupper, L. L., Nizam, A. and Rosenberg, E. S. (2013) <i>Applied regression analysis and other multivariable methods</i>, Fifth ed., Cengage Learning, Boston, MA.</li> <li>• Kline, P. (1994) <i>An easy guide to factor analysis</i>, Routledge, London ; New York.</li> <li>• Kline, R. B. (2016) <i>Principles and practice of structural equation modeling, Methodology in the social sciences</i>, Fourth ed., The Guilford Press, New York.</li> <li>• MacLean, W., William, P. (2008), <i>Introduction to Architectural Technology</i>, London: Laurence King Publishing.</li> <li>• Mazria, E. (1979). <i>The Passive Solar Energy Book</i>. Rodal Press.</li> <li>• McGregor, A., Roberts, C., Cousins, F. (2013). <i>Two Degrees. The Built Environment and our Changing Climate</i>. Routledge: New York.</li> <li>• Morgan, D. L. (1997) <i>Focus groups as qualitative research / David L. Morgan, Qualitative research methods series</i>, Second ed., Sage Publications, Thousand Oaks, Calif.</li> <li>• Moser, C. A. and Kalton, G. (1979) <i>Survey methods in social investigation</i>, Second ed., Gower, Aldershot, Hants, England; Brookfield, Vt., U.S.A.</li> <li>• Moses, L. E. (1986) <i>Think and explain with statistics</i>, Addison-Wesley Pub. Co., Reading, Mass.</li> <li>• Olgyay, V. (1973). <i>Design with Climate</i>. University Press: Princeton.</li> <li>• Ritchie, A., Thomas, R. (Editors) (2009). <i>Sustainable Urban Design. An Environmental Approach</i>. Taylor and Francis: Oxon.</li> <li>• Schiavon, S., Altomonte, S. (2014). Influence of factors unrelated to environmental quality on occupant satisfaction in LEED and non-LEED buildings. <i>Building and Environment</i>. 77, 148-159.</li> <li>• Schittich, C., ed. (2007). <i>In Detail: Building Skins</i>. Birkhäuser: Basel.</li> <li>• Schittich, C., ed. (monthly publication). <i>Detail: Review of Architecture</i>. Institut für Internationale Architektur-Dokumentation GmbH &amp; Co. KG: Munich.</li> <li>• Stephan, A., &amp; Athanassiadis, A. (2017). Quantifying and mapping embodied environmental requirements of urban building stocks. <i>Building and Environment</i>, 114, 187-202. doi:<a href="http://dx.doi.org/10.1016/j.buildenv.2016.11.043">http://dx.doi.org/10.1016/j.buildenv.2016.11.043</a></li> <li>• Stephan, A., &amp; Athanassiadis, A. (2018). Towards a more circular construction sector: Estimating and spatialising current and future non-structural material replacement flows to maintain urban building stocks. <i>Resources, Conservation and Recycling</i>, 129, 248-262. doi:<a href="https://doi.org/10.1016/j.resconrec.2017.09.022">https://doi.org/10.1016/j.resconrec.2017.09.022</a></li> <li>• Stephan, A., Crawford, R. H., &amp; de Myttenaere, K. (2013). A comprehensive assessment of the life cycle energy demand of passive houses. <i>Applied Energy</i>, 112, 23-34. doi:<a href="http://dx.doi.org/10.1016/j.apenergy.2013.05.076">http://dx.doi.org/10.1016/j.apenergy.2013.05.076</a></li> <li>• Stephan, A., &amp; Stephan, L. (2016). Life cycle energy and cost analysis of embodied, operational and user-transport energy reduction measures for residential buildings. <i>Applied Energy</i>, 161, 445-464. doi:<a href="http://dx.doi.org/10.1016/j.apenergy.2015.10.023">http://dx.doi.org/10.1016/j.apenergy.2015.10.023</a></li> <li>• Stephan, A., &amp; Stephan, L. (2017). Life cycle water, energy and cost analysis of multiple water harvesting and management measures for apartment buildings in a Mediterranean climate. <i>Sustainable Cities and Society</i>, 32, 584-603. doi:<a href="https://doi.org/10.1016/j.scs.2017.05.004">https://doi.org/10.1016/j.scs.2017.05.004</a></li> <li>• Stephan, A., &amp; Stephan, L. (2020). Achieving net zero life cycle primary energy and greenhouse gas emissions apartment buildings in a Mediterranean climate. <i>Applied Energy</i>, 280, 115932. doi:<a href="https://doi.org/10.1016/j.apenergy.2020.115932">https://doi.org/10.1016/j.apenergy.2020.115932</a></li> <li>• Thomas, R., Garnham, T. (2007). <i>The Environments of Architecture. Environmental Design in Context</i>. Taylor and Francis: Oxon.</li> <li>• Williamson, T. J. et al (2002). <i>Understanding Sustainable Architecture</i>. Taylor &amp; Francis: London</li> </ul> |
| <p>Faculty or entity in charge</p> | <p>LOCI</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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| <b>Programmes containing this learning unit (UE)</b> |                        |         |              |                                                                                     |
|------------------------------------------------------|------------------------|---------|--------------|-------------------------------------------------------------------------------------|
| Program title                                        | Acronym                | Credits | Prerequisite | Learning outcomes                                                                   |
| Master [120] in Civil Engineering                    | <a href="#">GCE2M</a>  | 3       |              |  |
| Master [120] in Architecture and Engineering         | <a href="#">ARCH2M</a> | 3       |              |  |