

Bioclimatic design

Lecturer

Ahmed Zaib KHAN MAHSUD (Coordinator)

Course mnemonic

CNST-H306

ECTS credits

5 credits

Language(s) of instruction

English

Course period

Second term

Campus

Solbosch

Course content

The course content comprises of an introduction to basic principles, theories, methods, concepts, strategies, and techniques of sustainable and bio-climatic design. The course content is thematically clustered into following topics:

1. **Introduction:** Climate, Buildings and Performance: Design for a multivariate condition
2. **Climate analysis** including solar geometry
3. **Energy systems**
4. **RESOURCES, MATERIALS, and their PROPERTIES**
5. **BioDesign**
6. **Water and Air Quality**
7. **Bioclimatic Passive Design**
8. **Passive heating, cooling and day lighting**
9. **Green skin tectonics**
10. **Assessing sustainable buildings**
11. **Case studies**

Assignment / exercises:

- A1. Case Study (CS) **Climate analysis**;
- A2. CS **Material analysis**;
- A3. CS **Passive energy systems**;
- A4. CS **Integrated Bioclimatic Design** (Final report).

Objectives (and/or specific learning outcomes)

The over-arching objective of the course is to develop the capability of students to understand, analyze, synthesize and apply the basic principles, theories, methods, concepts, strategies, designs, and techniques of bio-climatic design. During the course, the capability to understand and analyze is assessed

through the first three assignments. Whereas, their capability to analyze, synthesize and apply this knowledge in the framework of an integrated and sustainable design project (that they choose as the final case study) is evaluated through their final report and the written exam.

Pre-requisites and co-requisites

Co-requisites courses

ARCH-H200 | Projet d'architecture II | 15 crédits

Teaching method and learning activities

Excathedra lectures organized in thematic clusters, combined with 'a case-based' approach, and a series of interactive 'assignments' to impart *integrated learning* (from titular, exercise, peers, guest lectures, in oral and written forms, etc.):

Course activity:

- > *Course Lectures* (learning from titular & guest lecturers)
- > *Assignments / exercise* (learning from peers, each other)
- > *Presentation sessions* (confidence building through presenting in front of peers, learning from answering to questions).
- > *Interaction* (Active participation, Class/group discussions)

In groups:

- > 4 *Assignments*, total = 50%

Individual:

Written exam (individual, Written 50%)

References, bibliography and recommended reading

Books # 1, 2, 3, 10, 14-16 are recommended readings - reserved for consultation at the AIA library throughout the 2nd semester. The rest of the books – complementary, broader in scope - are also available upon request through email to the prof.

1. Almusaed, A., (2011). *Biophilic and Bioclimatic Architecture: Analytical Therapy for the Next Generation of Passive Sustainable Architecture* (London: Springer-verlag).
2. Minguet, J. M., (2009). *Bioclimatic Architecture* (Barcelona: Monsa; Bilingual edition).
3. Jones, D. L., (1998). *Architecture and the Environment: Bioclimatic Building Design* (London: Laurence King Publishing).
4. Weber, W., & Yannas, S. (Eds.) (2014). *Lessons from Vernacular Architecture* (Oxon & New York: Earthscan from Routledge).
5. Olgyay V., (1992). *Design With Climate: A Bioclimatic Approach to Architectural Regionalism* (New York: Van Nostrand Reinhold, 1992; also 1962 & 1973 eds. John Wiley & Sons).
6. Mazzoleni, I., & Price, S., (2013). *Architecture Follows Nature: Biomimetic principles for innovative design* (CRC Press / Taylor & Francis Group).
7. Myers, W., (2012). *Bio Design: Nature, Science, Creativity* (London: Thames & Hudson).

8. Pawlyn, M., (2011). *Biomimicry in Architecture* (London: RIBA Publishing).
9. Peters, T., (2011). *Experimental Green Strategies* (London: AD & Wiley).
10. Brown, G. Z., & DeKay, M (2013). *Sun, Wind, and Light: Architectural Design Strategies* (New York: John Wiley & Sons, 2001 2nd ed. & 2013 3rd ed.).
11. Kristinsson, J., Dobbelssteen, A. V. D., (2012). *Integrated Sustainable Design* (Delft: Delft U. Press).
12. Appleby, P., (2010). *Integrated Sustainable Design of Buildings* (London: Routledge).
13. Keeler, M., & Burke, B., (2009). *Fundamentals of Integrated Design for Sustainable Building* (New Jersey: Wiley).
14. Lechner, N., (2008). *Heating, Cooling, and Lighting: Design Methods for Architects*, 3rd edition (New York: Wiley).
15. Szokolay, S. (2004). *Introduction to Architectural Science: The basis of Sustainable Design* (Oxford: Architectural Press / Elsevier).
16. Guzowski, M., (1999). *Daylighting for Sustainable Design* (New York: McGraw-Hill).
17. Khan, A. Z., Allacker, K., & Vandevyvere, H., (2013). Design for the ecological age: Rethinking the role of sustainability in architectural education. *Journal of Architectural Education* 66(2): 175-185.

Course notes

Université virtuelle

Other information

Place(s) of teaching

Solbosch

Contact(s)

Course Titular: Prof. Dr. **Ahmed Z. Khan**

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Evaluation method(s)

Other, Group work, Oral presentation, Written report and written examination

written examination

Closed question with multiple choices (MCQ) and Open question with developed answer

Evaluation method(s) (additional information)

Integrated assessment method: In order to ensure integrated learning, students are assessed both individually and in groups, as well as in writing and orally. Four group assignments (50%) are assessed in writing (reports) and orally (presentations) during the course semester. For the individual level assessment, a written exam is held that accounts for 50%. All assignments are compulsory.

Assignments:

A1. Case Study (CS) Climate analysis 5%

A2. CS Material analysis 5%

A3. CS Passive energy systems 5%

A4. CS Integrated Bioclimatic Design 35%

Final exam (written) 50%

Total 100%

NOTE: Active participation in group assignments and minimum 75% attendance in the course lectures is required for sitting in the final exam.

For the 2nd sit exam (Aug./Sep): For unjustified absence from group assignments during the semester and regular exam, there is no opportunity offered for the 2nd exam in September of the same year (Article 61, 28, 29 & 30 of the ULB exams and juries regulation). However, if a valid, legitimate and convincing reason(s) are presented in writing (with proofs) during the semester, a 2nd sit can be arranged for the student, at the titular discretion.

Such students will have to do the 2nd sit exam individually. First, they will have to make an appointment with the titular in early July to define course content and a date for final exam (written 50%) followed by a Q&A (oral 50%).

Determination of the mark (including the weighting of partial marks)

Assignments (written + oral) = 50%; Final exam (written) = 50%. For details, see above the 'Method of assessment'.

Main language(s) of evaluation

English

Programmes

Programmes proposing this course at the Brussels School of Engineering

BA-IRAR | Bachelor in Engineering : Architecture | unit 3 and MA-IRCN | Master of science in Civil Engineering | finalité Professional/ unit 2

