

Department of Architecture.
Federal University of Technology, Akure.
ARC 810: Applied Climatology.
Course Outline.

Number of Units: 3.

Course description.

This course introduces the student of architecture to the application of building climatology in architectural design. The introduction covers basic concepts and climatic data. The maintenance of thermal comfort by the human body in different climatic conditions is used to determine the design of sun-shading devices and choice of building materials and elements. The design of buildings for effective natural ventilation is introduced. Emphasis is on placed on the achievement of environmental control through the building fabric and design, especially by using design aids such as the Mahoney tables and climatic site analysis.

Course Content.

1. **Basic concepts:** Movement of the Earth around the sun, solar time, solar radiation, global wind pattern, and spatial systems of climate.
2. **Climatic data:** Collecting the data, dry bulb temperature, humidity, the psychrometric chart, vapour pressure, precipitation, wind, sky conditions, other phenomena, recording the data, and variations in climate.
3. **Thermal Comfort:** Basic concepts of thermal comfort, thermal balance of the human body, factors affecting thermal comfort. The thermal indices. Choice of a thermal index for architectural design with climate in Nigeria. Case studies.
4. **Shading Devices:** Types of shading devices, design of shading devices, overheated and under-heated periods, use of sun-path diagrams, the shadow angle protractor, and examples of shading devices. Case studies.
5. **Thermal Design:** Thermal quantities, thermal properties of building materials and elements, heat flow through buildings, periodic heat flow, required thermal performance for building elements, and condensation.
6. **Ventilation:** Basic concepts in ventilation, air flow through buildings, air flow around buildings, prediction of ventilation, ventilation standards. Case studies.
7. **Air Conditioning:** Basic concepts of air conditioning, thermal comfort and indoor air parameters, climate and outdoor air parameters, solar heat gain, cooling load, air conditioners, automatic regulation of air conditioning, air flow in conduits, ventilation, air filtration.
8. **Climatic Site Analysis:** Site analysis, the site climate, the form of dwellings.
9. **The Mahoney Tables:** The design process, the Mahoney tables, example of use of the Mahoney tables.

10. **Design in the Zones:** Climatic zones for architectural design, general design guidelines, design in the coastal zone, design in the forest zone, design in the transitional zone, design in the highland zone, design in the savannah zone, and design in the semi-desert zone. Case studies.
11. **Control of Tropical Microclimates through Landscape Design:** Concepts in microclimate control, objectives of microclimate control through landscaping, landscape elements for microclimate control, the design process, landscaping climatic data analysis, problems of microclimate control through landscaping.
12. **Use of Computers:** The need for computers, software for building climatology.
13. **Solar Design:** Basic concepts of solar design, conversion of solar energy, solar collectors, uses of solar energy, solar heating systems, solar cooling systems, design of solar buildings. Case studies.
14. **Sustainable Architecture:** Sustainable development, environmental, economic and social sustainability, sustainable design process and assessment, green code for architecture, environmental architecture, ecological building, green building, sustainable architectural and urban design, energy efficiency, water conservation, green features of building materials, waste management.

Assessment.

Attendance:	10%.
Assignment I:	10% (Sun shading devices).
Assignment II:	10% (Design in the Zones).
Assignment III:	10% (Solar design and sustainability).
Examination:	60%.

Recommended reading.

1. Commission of the European Communities (1981). *Passive Solar Architecture in Europe. The results of the First European Solar Competition - 1980.* Ed. Lebens R. M. The Architectural Press Ltd, London.
2. Evans, M. (1980). *Housing, Climate and Comfort.* The Architectural Press, London.
3. Fitch, J. M. (1971). *American Building: The Environmental Forces that Shape It.* New York.
4. Givoni, B. (1976). *Man, Climate and Architecture.* Applied Science Publishers Ltd, London.
5. Koenigsberger, O. H. et al. (1974). *Manual of Tropical Housing and Building. Part I, Climatic Design.* Longman, London.
6. Markus, T. A. and Morris, E. N. (1980). *Buildings, Climate and Energy.* Pitman International, London.
7. Ogunsote, O. O. (1991). *Introduction to building climatology: A basic course for architecture students.* Ahmadu Bello University Press, Zaria.

8. Ogunsote, O. O. (1991). Computer Assessment of Architectural Design. *Habitat International - A Journal for the Study of Human Settlements*, 15:4, 1-16, Pergamon Press, London.
9. Ogunsote, O. O. and Prucnal-Ogunsote, B. (2002). Comfort Limits for the Effective Temperature Index in the Tropics: A Nigerian Case Study. *Architectural Science Review*, 45:2, 125-132, Sydney, Australia.
10. Ogunsote, O. O. and Prucnal-Ogunsote, B. (2002). Defining Climatic Zones for Architectural Design in Nigeria: A Systematic Delineation. *Journal of Environmental Technology*, 1:2, 1-14. School of Environmental Technology, Federal University of Technology, Akure.
11. Ogunsote, O. O. and Prucnal-Ogunsote, B. (2002). Choice of a Thermal Index for Architectural Design with Climate in Nigeria. *Habitat International - A Journal for the Study of Human Settlements*, 26:1, 1-19. Pergamon Press, London.
12. Olgyay, V. (1963). *Design with Climate - Bioclimatic Approach to Architectural Regionalism*. Princeton University Press, Princeton, New Jersey.
13. Prucnal-Ogunsote, B. and Ogunsote, O.O. (1988). COLDHOT - A Design Aid for Multi-Index Thermal Stress Analysis. *Architectural Science Review*, 31.3, 99-106. Sydney, Australia.
14. United Nations (1971). *Design of Low Cost Housing and Community Facilities, Volume I, Climate and House Design*. Department of Economic and Social Affairs, New York.
15. United Nations Centre for Human Settlements - HABITAT (1984). *Energy Conservation in the Construction and Maintenance of Buildings. Volume One: Use of Solar Energy and Solar Cooling in the Design of Buildings in Developing Countries*. UNCHS-HABITAT. Nairobi, Kenya.

Web sites.

<http://www.arch.hku.hk/research/BEER/sustain.htm>.