Subject : Climatology **Sem -2nd** **Sub Code-15AR223**

Objective

To impart scientific understanding of processes by which building and entire habitats can be designed to respond to nature, with climate as the basic parameter of design. To study fundamental parameters for thermal comfort. Equip the students with fundamental scientific concepts required to design climate responsive buildings, by offering a clear understanding of the various climatic zones and its climate responsive considerations in architectural design of building and built up areas.

Module 1

CLIMATE & THERMAL COMFORT

Effect of climate on habitat, shelter and environment. study of world climatic zones, characteristics of tropical climate.

Human comfort conditions – Thermal balance of the human body, comfort chart, comfort zone, Thermal comfort indices- Effective temperature, CET, humidity, radiation, wind, precipitation and its considerations at Macroclimate and Microclimate, Psychometric chart.

Module 2

SOLAR GEOMETRY & DESIGN OF SUNSHADING DEVICES

Apparent movement of the sun, sun path diagrams **(**solar chart) - Solar angles, Shadow angles, solar shading elements. etc -

Exercises on plotting isopleths, transfer of isopleths to solar chart, fitting a shading mask over the overheated period & design of sun shading devices for different orientations.

Module 3

PRINCIPLES OF THERMAL DESIGN AND VENTILATION IN BUILDINGS

Thermal quantities – heat flow rate, surface conductance, transmittance – calculation of U- value, convection, radiation, concept of sol-air temperature & solar gain factor, conductivity (k–value), resistivity, thermal capacity and emissivity, conductance through a multi-layered body.

Exercises in heat loss & heat gain under steady state conditions & its application in selection of appropriate materials for walls & roof.

Ventilation- The wind, The effects of topography on wind patterns, principles of natural ventilation, wind flow around buildings and air flow patterns inside buildings, air change, quality of air, use of fans, thermally induced air currents, Pressure losses: Stack effect, Venturi effect, Use of courtyard. Wind velocity – wind rose diagram.

Exercises on anemometer and its use. Wind tunnel experiment for wind movement around the buildings.

Module 4

DESIGN FOR CLIMATIC TYPES

Building design & lay out planning consideration for warm humid, hot dry & composite climates, Tropical climate. Evaluating various built form and orientation of single building, Building material and construction for comfort conditions in the tropics. Effect of landscape elements on Climate and Architecture.

Exercises on climatic data sets, analysis, climate graph, the Mahoney tables & its recommended specification.

Module 5

Exercises on design of small buildings for various climates.

References

1. *O.H. Koenigsberger, Manual of Tropical housing and building – Climatic Design, Orient Longman, Chennai, 1975.*
2. *M .Evans – Housing, Climate & Comfort , Architectural Press, London ,1980.*
3. *E.Schild & M.Finbow – Environmental Physics in construction & its application in Architectural Design, granadar , London, 1981.*

4. *Olgyay, A. and Olgyay, V., Solar Control and Shading Devices. New Jersey : Princeton University Press, 1976.*

Krishan, A. and Nick Baker, Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings, McGraw Hill Education Private Limited, India, 1999.

5. *B.Givoni, Man, Climate & Architecture, Applied Science, Essex 1982.*
6. *Donald Watson & Kenneth labs – Climatic Design – Mcgraw hill NewYork 1983.*
7. *A.Konya- Design Primer for Hot Climates, Architectural Press, London, 1980.*
8. *Chand, I. and Bhargava, P. K., The Climatic Hand Book. New Delhi : Tata McGraw-Hill, 1999.*