



Birla Institute of Technology & Science, Pilani

Hyderabad Campus

SECOND SEMESTER 2022-2023 Course Handout Part II

Date: 09-01-2024

In addition to Part I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : **CE F423**
Course Title : **Green Buildings and Energy Conservation**
Instructor-in-charge : **Murari R R Varma**

Scope and Objectives:

The course introduces sustainability and bioclimatic design concepts in the planning and construction of buildings. This will equip students with technical knowledge of energy-efficient green buildings. The course covers various aspects of bioclimatic architecture, like climate-sensitive design, passive solar architecture, and water management. The course will also guide students through projects to apply concepts and ideas for the design of a green building by introducing them to green initiatives and ratings.

Course Outcomes

At the end of the course, the student will be able

1. Identify and categorize vernacular architecture
2. Estimate heat flow through simple building elements and buildings.
3. Describe green building concepts and approaches like passive design.
4. Apply green building concepts to plan and design a simple green building.
5. Appraise a simple building based on any one green building rating system such as GRIHA

Textbooks:

- T1. Krishnan, A., Baker, N., Yannas, S., & Szokolay, S. (Eds.). (2001). *Climate responsive architecture, a design handbook for energy efficient buildings*. New Delhi: Tata McGraw–Hill Publishing Company. Contents available at CLEAR - Comfortable Low Energy Architecture: <http://learn.greenlux.org/packages/clear/index.html>
- T2. TERI & ICAEN (Institut Catala d'Energia). (2015). *Sustainable building design manual* (Vol. II). New Delhi: The Energy and Resources Institute (TERI) Press.

Reference Books:

- 1 The Energy and Resources Institute (TERI), Green Rating for Integrated Habitat Assessment (GRIHA) manual, New Delhi: TERI press, 2011.
- 2 S. V. Szokolay, Introduction to Architectural Science – The Basis of Sustainable Design, Second ed., Architectural Press / Elsevier, 2008.
- 3 O. Koenigsberger, A. Mayhew, S. V. Szokolay and T. G. Ingersoll, Manual of Tropical Housing and Building, Hyderabad: Universities Press, 2011.
- 4 Online materials, Note

Course Plan:



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Lecture no.	Learning Outcome	Topics to be Covered	Chapter in the Text Book
1-5	Differentiate traditional vs Vernacular Architecture; identify aspects of vernacular buildings in various Climate zones in India.	Introduction to bioclimatic architecture, Need for Sustainability in building environment; Traditional Vs Vernacular architecture; Vernacular buildings in different climate zones	T1, T2, R4
6-10	Describe the five climate zones in India, Interpret sun path Diagrams	Climate zones, Design Charts, Sun path diagram	T1, T2, R3,R2
11-15	List the sequence of climate responsive process of design Describe the aspects to be considered in the of a building in achieving minimal environmental footprint	Climate Responsive Scientific Process of Design Landform, topography, vegetation, water bodies; Orientation, S/V ratio, P/A ratio, Walls, Fenestration, Roof and floors	T1,T2
16-20	Explain adaptive model of thermal comfort. Calculate heat flow through building envelope	Thermal comfort and Heat flow in Buildings: Indices of thermal comfort, Calculation of thermal conductance, Heat flow through different building elements; Various software	T1, R4, R3
21-23	Describe various aspects of passive cooling and passive heating	Active vs passive, Passive solar architecture	T1,T2, R4
24-26	Describe daylight factor. Incorporate passive strategies for placement of openings in buildings	Ventilation and day lighting: Design and placement of openings	T1, T2, R2
27-28	Demonstrate strategies to conserve and recycle in buildings	Techniques to recycle, reuse and harvest water	T2, R4
29-34	Identify criteria essential to determining what makes a building material truly "green". Demonstrate concepts of life-cycle analysis, including economic and sustainability aspects and apply these concepts to green building materials.	Material properties, Energy efficiency using various materials, Emerging new materials, and Techniques for roofs, wall and foundations.	T2,R4
35-42	Appraise a simple building based on any one green building rating system such as GRIHA, IGBC, LEED	Energy Conservation Building Code Green building rating systems : Evaluation criteria of LEED, IGBC, GRIHA,BEE	R4



Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightage	Date, Time	Nature of Component
1	Mid semester Test	90 min.	30	12/03 - 4.00 - 5.30PM	OB
2	Term Project*	TBA	10	TBA	OB
3	Class Participation [#]	Continuous	10	TBA	OB
4	Assignment	TBA	15	TBA	OB
5	Comprehensive Examination	180 min.	35	09/05 AN	OB
	# Will be assessed using short quizzes/ design problems announced in class	*Two evaluations			

Chamber Consultation Hour: Tuesday 5- 6 PM.

Notices: Concerned notices will be displayed on Canvas.

Make-up Policy:

- Frivolous make- ups are not entertained. Prior permission is mandatory in genuine cases. Medical emergencies have to be supported by valid certificates.
- Make-up will not be provided in the case of in-class *evaluations/quizzes*. The best n evaluation out of a minimum n+2 (usually 7) will be considered. Students are requested to make an effort to attend the maximum no of *assessments* to avoid the need for makeup

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester, and no academic dishonesty is acceptable.

Instructor-in-charge
CE F423



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