

Course Title:	<b>Green Buildings</b>	Semester	1/II
Course Code:	<b>BETCK105B /205B</b>	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:1:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03
<p><b>Course Learning Objectives</b></p> <p><b>CLO 1.</b> Understand the sustainable and cost effective techniques in construction</p> <p><b>CLO 2.</b> Apply cost effective Technologies and Methods in Construction</p> <p><b>CLO 3.</b> Understand the contributions buildings towards Global warming</p> <p><b>CLO 4.</b> Understand the Rating systems and sustainable practices</p> <p><b>CLO 5.</b> Understand the concept of passive strategic design &amp; green composites</p>			
<p><b>Teaching-Learning Process</b></p> <p>These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> <li>1. Lecture method (L) does not mean only the traditional lecture method, buta different type of teaching method may be adopted to develop the outcomes.</li> <li>2. Arrange visits to nearby sites to give brief information about the Civil Engineering structures.</li> <li>3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.</li> <li>4. Encourage collaborative (Group) Learning in the class.</li> <li>5. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.</li> <li>6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.</li> <li>7. Topics will be introduced in multiple representations.</li> <li>8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.</li> <li>9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.</li> <li>10. Individual teachers can device innovative pedagogy to improve teaching-Learning.</li> </ol>			

## **Module-1: Introduction to the concept of cost effective construction (8 hours)**

### **Self-study: Green materials and its availability**

Overview of green building movement; Concept of Green building and sustainable development; Issues and strategies of Green building and sustainable development; Uses of different types of materials and their availability –Rocks, Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime - Pozzolana Cement- Gypsum Board- - Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Recycling of building materials – Brick- Concrete- Steel- Plastics

**Applications: Understanding the difference between sustainable and conventional building materials.**

**(RBT Levels: L1, L2 and L3)**

## **Module-2: Environment friendly and cost effective Building Technologies (8 hours)**

### **Self-study: Various ready to use building elements**

Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Alternate roofing systems - ready to use building elements - wood products - steel and plastic - Contributions of agencies - Costford - Nirmithi Kendra - Habitat

**Applications: Gain knowledge about cost effective construction technologies**

**(RBT Levels: L1, L2 and L3)**

## **Module-3: Global Warming (8 hours)**

### **Self-study: Embodied Energy in various Green Materials**

Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle costof Buildings.

**Applications: Understanding the Cost estimation of Green and conventional building**

**(RBT Levels: L1, L2 and L3)**

## **Module-4 (8 hours): Green Building rating Systems**

### **Self-study: Indian Green certified buildings and its weightage**

IGBC, BREEAM – LEED - GREEN STAR - GRIHA for new buildings – Purpose - Key highlights - Point System with Differential weight age. Green Design – Definition - Principles of sustainable development in Building Design

- Characteristics of Sustainable Buildings – Sustainably managed Materials  
Integrated Lifecycle design of Materials and Structures (Concepts only)

**Applications: Awareness about various Rating systems and its procedures**

**(RBT Levels: L1, L2 and L3)**

## **Module-5 (8 hours) Utility of Solar Energy in Buildings & Green Composites**

### **Self-study: Various Passive strategies and green composites adopted in Indian buildings**

Utility of Solar Energy in Buildings: Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

Green Composites for Buildings: Concepts of Green Composites. Water Utilization in Buildings, Low Energy Approaches to Water Management. Management of Sludge Water and Sewage. Water tanks - Septic Tanks- Management of Solid Wastes. Urban Environment and Green Buildings. Green Cover and Built Environment.

**Applications: Awareness about passive strategies incorporated in green building**

**(RBT Levels: L1, L2 and L3)**

### **Course outcome**

At the end of the course the student will be able to:

**CO1:** Analyze the environmental impact of different building materials and assess their suitability for sustainable construction, considering factors such as resource availability, energy consumption, and life-cycle impact.

**CO2:** Implement environmental-friendly building technologies, such as energy-efficient systems, waste reduction methods, and renewable energy solutions, in construction projects to reduce environmental footprint

**CO3:** Analyze the impact of engineering solutions in mitigating global warming and assess the effectiveness of engineering interventions at local, regional, and global scales in reducing greenhouse gas emissions.

**CO4:** Apply green building rating systems to design and implement construction projects that meet sustainability standards for energy efficiency, water conservation, and material use.

**CO5:** Analyze the effectiveness of passive strategies in reducing energy consumption and improving building comfort, considering factors such as climate, location, and building use

**Activities**

- 1. Research and write** case studies on sustainable construction in India
- 2. Create a public awareness** campaign on the importance of reducing greenhouse gas emissions
- 3. List the different Green Composites** used in green construction with its characteristics and images
- 4. Research and write** case studies on specific climate change events, due to global warming- One case study
- 5. Techniques to enhance** various low energy approaches to water – Explain with the help of any 2 case studies various low energy approaches to water
- 6. Debate on Green Building Practices:** Organize a debate on the effectiveness of various green building norms and practices, encouraging critical thinking and discussion
- 7. Research Paper Presentation:** Students can research various green building certification systems (like LEED, BREEAM, etc.) and present their findings, focusing on the criteria, benefits, and challenges.
- 8. Case Study Analysis:** Analyze successful green buildings, examining their design, construction practices, and how they meet specific rating norms.
- 9. Design Competition:** Organize a design challenge where students create plans for a green building, incorporating sustainable materials, energy efficiency, and water conservation strategies.
- 10. Model Building:** Use materials like recycled cardboard or eco-friendly products to create scale models of green buildings that adhere to specific rating norms.

**Course Assessment and Evaluation Details (both CIE and SEE)****Continuous Internal Evaluation: 50 marks**

Theory Assessment Tool	Marks	Reduced marks
IAT-1	25	25
IAT-2	25	
Assessment-1(activity based)	25	25
Assessment-2 (activity based)	25	

**Semester End Examination (SEE) : 50 marks**

SEE	Marks	Reduced marks
Course end examination(Answer any one question from each unit – Internal choice)	100	50

**Suggested Learning Resources:****Test Books**

1. Harhara Iyer G, Green Building Fundamentals, Notion Press
2. Dr. Adv. HarshulSavla, Green Building: Principles & Practices
3. Introduction to Green Buildings & Built Environment, Indian Green Building Council,
4. Sustainable Construction: Green Building Design and Delivery Charles J. Kibert, Willey publishers

**Web links and Video Lectures (e-Resources):**

- <https://www.youtube.com/watch?v=THgQF8zHBW8>
- [https://www.youtube.com/watch?v=DRO\\_rIkywxQ](https://www.youtube.com/watch?v=DRO_rIkywxQ)

**COs and POs Mapping (CO-PO mappings are only **Indicative**)**

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>CO1</b>	2				1	2	3	1			1	1
<b>CO2</b>	2				1	2	3	1			1	1
<b>CO3</b>	2				1	2	3	1			1	1
<b>CO4</b>	2				1	2	3	1			1	1
<b>CO5</b>	2				1	2	3	1			1	1

**Level 3- Highly Mapped,    Level 2-Moderately Mapped,    Level 1-Low Mapped,    Level 0- Not Mapped**