



Subject: Green and Smart Building – BETCV14311

Type of course: Minor Stream

Prerequisite: NA

Rationale:

Green and smart buildings are important in civil engineering because they help address environmental challenges and improve the quality of life for people. Green and smart buildings can improve indoor air quality, reduce pollution. Smart building technologies can help make building management systems more sustainable and cost-effective.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
3	0	0	3	60	30	10	00	50	150

Legends: CI-ClassRoom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.



Course Content:

Sr. No	Course Content	Hrs.	% Weightage
1	GreenBuilding Green Building initiatives - characteristics of a green building – green building in India – depleting natural resources of building materials – renewable and recycled resources – energy efficient materials – green cement- biodegradable materials – smart materials - case study.	10	25%
2	Sources of energy Renewable and non-renewable source of energy – coal, petroleum, nuclear, wind, solar, hydro, geothermal sources – potential of these sources, hazards, pollution – global scenario - Carbon emission – forecasting, control of carbon emission – air quality and its monitoring – carbon footprint – environmental issues – minimizing carbon emission.	10	20%
3	Smartbuildings Intelligent buildings – building automation - building services in high rise buildings - case studies of residence, office building and other buildings in each zone. – Case Study.	9	15%
4	Actuator techniques Actuator and actuator materials – piezoelectric and electrostrictive material – magneto structure materials – shape memory alloys – electro rheological fluids-electromagnetic actuation – role of actuators and actuators materials.	8	25%
5	Materials for “Green systems” Green materials - biomaterials - Biopolymers, bioplastics and composites nanotech materials for truly sustainable construction – windows – skylights and lighting – paints – roofs walls and cooling. Multifunctional gas sensors. – optical interference sensor.	8	15%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	Prepare a green building model: In this activity, each group of students will design a green building model using physical materials like cardboard, foam sheets, etc. and upload it on GMIU web portal.	10
2	Smart building technology research: In this activity, students create a presentation or poster summarizing their findings on one specific technology and its impact on energy efficiency	10



	and occupant comfort. Students are required to upload their presentation on GMIU web portal.	
3	Field Visitor Virtual tour: In this activity, students observe real-world applications of smart building technologies at local smart buildings or a virtual tour of one. Students will prepare the discussion on the technologies observed and their benefits. Students are required to upload their finding report on GMIU web portal.	10
4	Case Study Analysis: Students will choose a smart building and research its design, technologies used, and performance outcome. They will prepare a case study report that highlights lessons learned and best practices. Students are required to upload their report on GMIU Web portal.	10
5	Poster making: In this activity, each group of students will prepare a poster on control of carbon emissions, renewable and non-renewable sources of energy, environmental issues, and air pollution. Students are required to upload their prepared poster on GMIU Web Portal.	10
Total		50

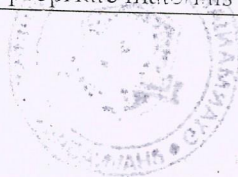
Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	10%	30%	30%	30%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Illustrate the concepts of green building.
CO2	Adopt renewable energy for buildings.
CO3	Implement automation techniques in buildings.
CO4	Demonstrate actuator techniques for automation.
CO5	Choose appropriate materials for green buildings.



Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

- [1] Sustainable Construction, Charles J. Kibert, third edition.
- [2] Green building A to Z, Jerry Yudelson.
- [3] Advanced Technology for smart buildings, James Sinopoli.

