



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Minor/Hons. Program

Level: UG

Branch: Minor/Hons. Smart Cities

Subject Code: BE050AF011

Subject Name: Sustainable Smart City

w. e. f. Academic Year:	2026-27
Semester:	5
Category of the Course:	Core Courses

Prerequisite:	Develop knowledge, understanding, and critical thinking related to smart, sustainable urban development
Rationale:	To understand the concept of smart city and associated challenges, latest technologies used in intelligent building.

Course Outcomes:

Sr. No.	CO statement	Marks% weightage
CO-1	Student will learn how to implement sustainability in planning process at different spatial scales.	25
CO-2	Study the guidelines, system, principles and practice of sustainable development, within the context of planning	30
CO-3	Learn different tools of sustainability planning and examine the core challenges relating to the foundation of sustainable smart cities	25
CO-4	Understand concepts and models of 21 st century green and smart cities; know current international strategies and energy conservation techniques regarding sustainable development of urban areas	20

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
L	T	P	PBL*	TH		Theory		Tutorial / Practical			
						ESE (E)	PA (M)	PA (I)	TW/SL =PBL (I)	ESE (V)	
45	00	30	45	120	04	70	00	00	30	50	150

***Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.**

Where L = Lecture, T= Tutorial, P= Practical, TW/SL = Term-Work / Self-Learning, TH = Total Hours, PA = Progressive Assessment, ESE = End-Semester Examination



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Sr. No.	Content	Total Hrs
1	Introduction: The evolution of cities up to the present day: social, political and spatial planning models, Urbanisation and its impacts on cities, Urban evolution in India, Changing patterns of urban growth, Quality of life in the city.	10
2	Challenges and opportunities in sustainable smart cities: Principles of green and smart cities, Eco challenges in the contemporary cities; International initiatives including UN and EU level; Corporate social and environmental strategies in cities.	10
3	Fundamentals of sustainable development: Sustainability and Sustainable development, Climate change indicators and their meaning for cities; Green technologies in cities; Green buildings and ecological footprint, Green Infrastructure, Urban sustainability foundations, models & theories. Meteorological parameters for smart cities: -Introduction to urban meteorology, applications of meteorology in smart cities, various meteorological parameters, measuring instruments of meteorological parameters, urban climate monitoring systems. Air Quality Index (AQI) in smart cities: - Fundamentals of air quality index (AQI), air quality monitoring systems, air dispersion and modelling, smart solutions for AQI improvement.	10
4	Energy efficient city services: Role of local authorities and public participation in shaping the cities; City services: utilities (water, energy and communications), public street lighting, roadways and traffic, public transport, environmental quality, cleaning of public spaces, waste and sewage management, maintenance, on the management of cities and their innovation potential, LEED, GRIHA,IGBC,USGBC. Building Information Modelling (BIM) - Introduction to BIM, applicability of BIM in 3D modelling, Energy simulation using BIM.	15



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HVAC Systems in smart cities- Basics of Heating, Ventilation and Air Conditioning in building, Energy-efficient HVAC systems planning, IoT Integration and Smart sensors in HVAC.	
TOTAL	45

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
05 %	25 %	20 %	25 %	10 %	15 %

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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.

Reference Books:

1. How Green is Cities? By Dimitri Devuyt, Colombia University Press, New York.
2. Sustainability Science and Engineering Vol 1, By Martin A. Abraham (editor) Elsevier Publication.
3. www.smartcitiescouncil.com
4. City Region 2020, by Joe Ravetz, Earthscan Publication Ltd, London, 2000.

List of Practicals:

- 1. Study of IGBC Guideline in context to energy conservation**
 - a. Prepare a report
- 2. Smart building with GRIHA criteria**
 - a. Understanding norms and standards of GRIHA
 - b. Developing smart building case study using GRIHA criteria
- 3. Smart building with LEED criteria**
 - a. Understanding norms and standards of LEED
 - b. Developing smart building case study using LEED criteria
- 4. Preparing a case study and model preparation on smart city**
 - a. Prepare a list of 100 smart cities and finalize one potential smart city
 - b. Different criteria for smart cities and their progress report on any one smart city
 - c. Preparing a detailed report on a case study where smart materials and smart construction techniques have been used.
- 5. Air Quality Index studies & Meteorology in Smart Cities**



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- a. AQI calculation from raw pollutant data
 - b. GIS mapping of pollution hotspots
 - c. Case study of Delhi AQI variations
 - d. Meteorological Parameters study
- 6. Building Information Modelling (BIM) & HVAC Systems**
- a. Study of Building Information Modelling in Modern Construction
 - b. Energy-Efficient HVAC Planning

List of Open Source Software/learning website:

1. <https://smartcities.data.gov.in>
2. <https://www.sciencedirect.com>
3. <https://nptel.ac.in>
4. <https://onlinecourses.nptel.ac.in>
5. <https://swayam.gov.in>

List of suggested activities for Problem Based Learning:

Sr. No	Name of the Activity	No. of Hours	Evaluation Criteria
1.	Technical site visit/ Industrial visit	Visit: 5h, Report preparation: 5h, Total: 10h	Based on the report submitted. Report should contain observations and calculations based on industry/ site data.
2.	Technical Video based learning related to the subject	Duration of video: 5h Report preparation: 5h, Total: 10h	Report/presentation based on the video learning outcomes.
3.	Self-learning on-line course	Minimum duration of the course should be 10h.	Examination based assessment at the end of course. Based on the certificate produced.
4.	Videos on Industrial safety aspects based on subject	Duration of video: 5h Report preparation: 5h Total: 10h	Based on quiz/report submitted
5.	Discussion on research paper based on relevant subject	5 research paper: 20h	Summarize research paper and evaluation critical parameters
6.	Poster/chart/Power Point preparation on technical topics	Duration: 6h	Based on poster/chart preparation and presentation skills
7.	Working/non-working model on technical topics	Working: 12h Non- working: 8 h	Based on inter department/external evaluation
8.	Industrial exposure for 2-3 days to observe and provide tentative solutions on society /environment/health/any	Duration: 15 h for industrial exposure Problem identification and tentative solution :10h	Based on evaluation of critical problems and solutions



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	other issue	Total:25 h	
9.	Group Discussion on emerging/trending technical topics based on subject	Duration: 1 h each	Based on performance in group discussion, technical depth, knowledge etc.
10.	Real world case studies based learning	Duration of data Collection /study: 5h Report preparation: 5h, Total: 10h	Based on in-depth study, technical depth, data collected, fact finding, etc.
11.	Expert lecture/session	Duration 2 hrs for attending the lecture/session-2hrs and for report writing 2hrs	Based on the proof of Attendance and report submitted
12.	Online Technical Quizzes/Simulations	Multiple quizzes summing up to 10h	Based on quiz scores and reflection report after each quiz.
13.	Tech Blog/YouTube Channel Curation of relevant subject	10h (Content curation +Analysis) of relevant subject	Summary report on curated content and learning outcomes.
14.	Patent Search and Innovation Gap Identification	10h (Search + Report)	Based on number of relevant patents analyzed and identification of innovation scope.
