GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Minor/Hons. Degree
Level: UG
Branch: Minor/Hons. Next Generation Smart Village
Subject Code: BE040AD011
Subject Name: Fundamentals of Smart Village

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	Core Courses

Prerequisite:	Basic of Science and Engineering
Rationale:	The subject helps to build concept of Smart village and explore various requirements to develop a Smart Village

Course Outcomes:

Sr. No.	CO statement	Marks% weightage
CO-1	Understand concept and requirement of Smart Village	Remember, Understand
CO-2	Explore possibilities for scope of socio-economic development of village	Analyze
CO-3	Recognize the various infrastructure demands for smart village development	Understand, Evaluate
CO-4	Learn about Government Schemes & Policy for Rural Development	Remember, Understand
CO-5	E-Governance Concept and its implementation for Rural Development	Understand, Application

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	PBL*	TH		ESE (E)	PA (M)	PA (I)	PBL (I)	ESE (V)	
45	0	30	45	120	4	70	0	0	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

Content:

Sr. No.	Content	Total Hrs
1	**Introduction**: Rural Settlement, Smart Village Concept, MDGs (United Nations, 2015a), Idealised Model of Next Generation Smart Village	03
2	**Socio-Economic Development:** Education and Skill Development, Occupation and Earning, Business/ Agriculture, Ecotourism, Economics, Self Help Groups	04
3	**Requirements of a Smart Village** **Agriculture:** Agriculture and Yields, Rural Commodities, Sustainability **Housing:** Safe, Affordable, Sustainable homes, Available materials and labours, Vernacular form of architecture, Methods of Adobe Construction, building earthquake resistant houses, earthquake resistant Non-engineered Construction **Energy:** Sustainable generation & use, Electricity supply and consumption, Conventional & Nonconventional practices, affordable and alternative sources of energy **Waste Management & Sanitation:** Waste Management, Energy Generation, Manures, Clean Drinking water, Sanitation Facilities **Transportation:** Transportation facility & connectivity, Income Generation, Accessibility, safe and affordable, well-maintained road grids network **Health:** Health and Well-being, PHC and other Medical facilities, Awareness	16
4	**Government Schemes & Policy for Rural Development:** Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM), Deen Dayal Upadhyay – Gramin Kaushalya Yojana (DDU-GKY), Pradhan Mantri Awaas Yojana – Gramin (PMAY-G), Pradhan Mantri Gram Sadak Yojana (PMGSY), Shyama Prasad Mukherjee National RuRBAN Mission and National Social Assistance Programme (NSAP) Amrit Mahotsav, MGNREGA, PMAY-G, PMGSY, SAGY, SwachhGram, Gram Swaraj Abhiyan, etc.	12
5	**Governance:** E-Governance, Structure of governance and strategies, Planning and Implementation, Civic Engagement, Security & Safety	10
	TOTAL	

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	20	45	10	10	0

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

Reference Books:

1. Planning, Housing and Infrastructure for Smart Villages By Hemanta Doloi, Ray Green, Sally Donovan, Routledge Publication
2. Affordable Housing for Smart Villages By Hemanta Doloi, Sally Donovan
3. Smart Villages: Bridging the Global Urban-Rural Divide, V. I. Lakshmanan, Arun Chockalingam, V. Kumar Murty, S. Kalyanasundaram, Springer International Publishing
4. India's Changing Villages By S.C. Dube, Routledge Publication

List of Tutorials:

1. Enlisting requirements of Smart Village
2. Inventory related to Socio-Economy Development
3. Inventory related to Agriculture Land and Crop Yields
4. Building Materials and Labour availability Study, building typology-engineered, non-engineered
5. Inventory related to Conventional & Non-conventional sources of energy
6. Inventory related to rural infrastructure and gap analysis
7. Study related to implementation of various govt. scheme
8. Any other relevant activities
9. REPORT (PART-1): Designing Measurement sheets/ survey forms/ Questionaries' forms for various types of survey

List of Open Source Software/learning website:

1. https://www.iitk.ac.in/nicee/wcee/article/WCEE2012_3279.pdf
2. https://www.nicee.org/IAEE_English.php

List of suggested activities for Problem Based Learning:

Sr. No.	Activity Name	Units Mapped	Hours	Brief Description	Evaluation Criteria / Remarks
1	Introduction to GIS and QGIS Environment	Unit 3	5	Understand the basics of GIS, its applications, and get familiar with the QGIS interface. Learn about layers, coordinate systems, and basic navigation tools.	Can explain what GIS is and identify components of QGIS interface. Successfully open and view vector and raster layers.
2	Working with Vector Data	Unit 3	5	Learn about vector data types (points, lines, polygons), attribute tables, selection methods, and basic editing of vector layers. Practice creating and saving shapefiles.	Can create and edit vector layers. Can select features and view/edit attribute data. Saves a custom shapefile correctly.
3	Working with Raster Data	Unit 3	5	Understand raster data (DEMs, imagery), perform basic visualization, raster clipping, and generate contour/hillshade layers.	Can import and visualize raster data. Performs clipping and generates hillshade or contour successfully.
4	Coordinate Reference Systems (CRS) and Georeferencing	Unit 3	8	Learn map projections, CRS concepts, and how to reproject layers. Practice georeferencing a scanned map using control points.	Can explain CRS and projections. Successfully georeferences a scanned map with minimal error.
5	Attribute Data Management and Table Operations	Unit 3	5	Explore attribute tables, perform joins with CSV/Excel data, use the field calculator, and run queries to filter features.	Can join external data correctly.Performs attribute calculations. Runs queries using expressions.
6	Thematic Mapping and Map Design	Unit 3	5	Apply symbology, create thematic maps (graduated, categorized), add labels, and design map layouts with	Creates a thematic map with correct symbology. Designs and exports a professional map layout (PDF/PNG).

				legends, scale bars, and titles using Print Layout.	
7	Spatial Analysis and Geoprocessing Tools	Unit 3	5	Perform spatial operations such as buffer, clip, union, intersect, and dissolve. Conduct raster analysis like slope, aspect, and zonal statistics.	Successfully runs vector and raster analysis tools. Interprets spatial relationships correctly in outputs.
8	Online Data and QGIS Plugins	Unit 3	5	Learn to access and use web data sources (OpenStreetMap, XYZ Tiles). Explore key plugins like QuickMapServices, OpenLayers, and MMQGIS.	Can add basemaps and OSM layers.Uses at least two plugins effectively. Downloads and visualizes online data layers.
9	Mini Project and Review	Unit 3	5	Apply all learned concepts in a mini GIS project (e.g., flood-prone zone mapping, land-use map, or campus layout). Prepare a short report and export final map layout.	Completes a project combining vector, raster, and attribute data. Map layout is accurate and well-designed. Submits project file (.qgz) and final map (PDF).

Total Hours: 45

Note:

- **All the suggested activity should be related to the subject.**
- **The number of hours is suggestive. Faculty can sub-divide the number of hours based on the activity. However, total number of hours is fixed.**
- **Rubrics for the evaluation can be prepared by the faculty.**
- **All records pertaining to the evaluation and assessment of self-learning activities must be properly maintained and preserved at the institute level. These records should be made available to the university upon request.**
- **Institutes are encouraged to utilize digital platforms, such as Microsoft Teams, for effective record-keeping and to ensure transparency in the evaluation and assessment of self-learning activities.**

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