GUJARAT TECHNOLOGICAL UNIVERSITY

SCHOOL OF ENGINEERING AND TECHNOLOGY

EVENT REPORT

ATAL BASIC FDP on

"Emerging AI Technologies for Civil Engineering Professionals"

GTU-SET conducted the ATAL-sponsored one-week FDP on *Emerging AI Technologies for Civil Engineering Professionals* from 12 to 17 October 2026, with ten expert sessions, two article discussions, daily hands-on labs, one industrial visit and an individual assessment.

Programme at a glance

Item	Detail
Title	Emerging AI Technologies for Civil Engineering Professionals
Sponsor	AICTE Training and Learning Academy (ATAL)
Organized by	School of Engineering and Technology, Gujarat Technological University (GTU-SET), Chandkheda Campus, Ahmedabad
Duration	12–17 October 2026 (6 days)
Mode	Offline
Coordinator(s)	Dr. Jignesh A. Amin, Professor, GTU-SET
Co-coordinator(s)	Prof. Mridul Seth,
Registered participants	74 participants applied out of 60 approved.
Expert sessions	10 (4 academia, 6 industry and consultancy)
Industrial visit	Protthapan Technologies Pvt. Ltd., Ahmedabad (Day 5)

About the programme

The AICTE Training and Learning (ATAL) Academy supports faculty development programmes in emerging and thrusts areas so that teachers in technical institutions can update their knowledge and bring it into teaching and research. The School of Engineering and Technology is the in-house engineering school of Gujarat Technological University at the Chandkheda campus. The Department of Civil Engineering works on structural and earthquake engineering, water resources, transportation and geomatics, with growing use of data-driven methods.

Objectives of the FDP

1. Introduce AI and ML methods (XAI, ensemble learning, neural networks, computer vision, LLMs) relevant to civil engineering.
2. Demonstrate automation of structural analysis by coupling SAP2000 OAPI with Python.
3. Expose participants to field applications: drone analytics for highways, digital surveying, BIM, agriculture and water resources, and digital twins.
4. Build research capability through guided discussion of recent journal articles.

5. Connect academia with industry practice through expert talks and an industrial visit.

Day-wise proceedings

Day 1 – Monday, 12 October 2026

Session 1 (10:00 AM–12:30 PM): XAI application in defining the influencing parameters for water quality – Prof. Mridul Seth, Assistant Professor, GTU-SET. The session showed how explainable AI identifies which physico-chemical parameters drive ML predictions of water quality, so that model outputs can be interpreted and trusted by decision-makers. Points covered included SHAP values as the average marginal contribution of a feature to a prediction, LIME as a local explanation of an individual prediction, the meaning of feature importance, the need for interpretability when model outputs inform municipal drinking-water decisions, and why complex models are called black boxes.

Article discussion (12:30–1:30 PM): *Machine learning-based approach for assessing the seismic vulnerability of reinforced concrete frame buildings*, Journal of Building Engineering 97 (2024) 110785. Participants discussed the Monte-Carlo generation of 1,000 pushover analyses of a 4-storey RC frame with fck and fy as random variables, the capacity-spectrum route to damage states and damage index, the single-hidden-layer ANN damage-state classifier (87–88% accuracy) and the stacked LASSO–Random Forest–Gradient Boosting regressor (lowest RMSE of 0.07).

Session 2 (2:30–5:00 PM): Integration of the OAPI feature of SAP2000 using Python programming – Dr. K. M. Gondaliya, Assistant Professor, GTU-SET. The session covered connecting Python to SAP2000, building and modifying models through the API, running analyses and extracting results, and automating parametric and Monte-Carlo studies for seismic vulnerability assessment. Participants were introduced to the SapModel object, through which model creation, analysis and results extraction are accessed, and to the OAPI return code, where zero indicates that a call executed successfully.

Hands-on lab (5:00–6:00 PM): Practice with Python scripts that connect to SAP2000 through the OAPI and run analyses.

Day 2 – Tuesday, 13 October 2026

Session 3: Emerging AI for highway intelligence – NHAI DAMS (Drone Analytics Monitoring System) – Mr. Yogesh P. Pathak, Director, RIJA Consultants Pvt. Ltd. The session presented the use of drone surveys and AI-based image analytics for monitoring highway projects, including progress tracking and condition assessment. The speaker introduced drones and the sensors they carry, and explained photogrammetry concepts such as ground sampling distance (GSD), the ground distance represented by one image pixel.

Article discussion (12:30–1:30 PM): *Multivariate analysis of inland water quality index in parts of Vapi district, Gujarat, India*, Water Supply (2024). Participants discussed the use of multivariate statistical methods with a water quality index to interpret monitoring data. Principal component analysis was highlighted as a way to transform many correlated water-quality parameters into a few uncorrelated components.

Session 4: AI/ML for information management – Mr. Parin Shah, Delivery Manager, Tech Mahindra. The session covered how AI/ML and large language models help organise, search and use large volumes of project and enterprise information. The speaker traced the information-management lifecycle and its AI touchpoints, and explained retrieval-augmented generation (RAG), in which relevant passages are retrieved from project documents and supplied to a language model to ground its answers.

Hands-on lab (5:00–6:00 PM): Guided practice on drone-image analytics and LLM-based retrieval of project information.

Day 3 – Wednesday, 14 October 2026

Session 5: Surveying and mapping using digital instruments – Dr. H. J. Chauhan, Assistant Professor, Birla Vishvakarma Mahavidyalaya, Anand. The session covered modern digital surveying instruments and mapping workflows. Instruments and techniques covered included electronic distance measurement (EDM), the digital level with bar-coded staff, the digital theodolite, the total station with prism reflector, GPS/GNSS positioning with differential and RTK corrections, and the use of GIS (raster and vector data) to integrate survey data. A field demonstration of surveying and GNSS equipment was held on the campus.

Article summary (12:30–1:30 PM): Participants presented summaries of recent journal articles on AI/ML applications in civil engineering.

Session 6: Seismic response prediction of asymmetric structures with SMA dampers using machine learning algorithms – Dr. Anant Parghi, Associate Professor, SVNIT Surat. The session discussed torsional response of plan-asymmetric buildings, shape memory alloy dampers, and ML models that predict seismic response in place of repeated nonlinear analyses. Participants noted that plan asymmetry arises when the centre of mass and the centre of rigidity do not coincide, producing torsion, and that the superelasticity of shape memory alloys (recovery of large strains) makes them attractive for dampers.

Hands-on lab (5:00–6:00 PM): Guided practice on digital surveying data and ML-based seismic response prediction.

Day 4 – Thursday, 15 October 2026

Session 7: Application of Building Information Modelling in projects – case study – Mr. Pranav Suthar, Chief Technical Officer, Next Synergy. The session used project case studies to show BIM workflows such as coordination, clash detection and project delivery. IFC was explained as an open, vendor-neutral data schema for exchanging BIM data, and 4D BIM as linking the 3D model with the construction schedule.

Session 8: Tree counting to crop water estimation using AI/ML – Dr. Harsh Shah, Co-Founder, Agrocast Analytics. The session showed how remote-sensing imagery and AI models are used for tree counting and estimating crop water requirements. Topics included object detection (for example YOLO-type models) for counting individual trees, the crop water requirement $ETc = Kc \times ET0$, and the use of satellite imagery together with GIS, including spatial resolution, passive and active sensors and NDVI.

Hands-on lab (5:00–6:00 PM): Guided practice on BIM data exchange and AI-based crop water and tree-count estimation.

Day 5 – Friday, 16 October 2026

Industrial visit (9:00 AM–1:00 PM): Protthapan Technologies Pvt. Ltd., near Vaishnodevi Circle, Ahmedabad, a private-sector firm working in defence and internal security, and space and research manufacturing. Participants toured the facility and interacted with the company's engineers on its manufacturing, quality-control and automation practices, and discussed how AI-enabled systems are used in such production environments.

Session 9 (2:30–5:00 PM): Emerging AI technologies for civil engineering professionals – Mr. Rashmikant Thakkar, Independent Consultant, PMC and Construction Advisory. Drawing on over 30 years of practice, the speaker discussed how AI tools are entering project management and construction advisory work. The discussion included the limitations of generative AI tools in drafting specifications and reports, notably hallucination, that is, fluent but factually incorrect output, and the need for professional verification.

Hands-on lab (5:00–6:00 PM): Guided practice on applying AI tools to project management and construction advisory tasks.

Day 6 – Saturday, 17 October 2026

Session 10 (10:00 AM–12:30 PM): Development of digital twin for civil engineering – Dr. Lalit Singh, Head, AI Application, NPCIL-BARC. The session explained how sensor data, numerical models and AI combine into digital twins for monitoring and decision support of critical infrastructure. A digital twin was distinguished from a detailed 3D model by its continuous two-way data link with the physical asset.

Assessment and Reflection Journal (2:00–4:00 PM), followed by the **valedictory session (4:00–5:00 PM)** (see below).

Valedictory, outcomes and acknowledgements

Valedictory session (17 October 2026, 4:00–5:00 PM). Dr Madhuri D. Bhavsar, Director, GTU-SET addressed the participants. The coordinator presented the programme report and participants shared their experience of the FDP. Certificates will be issued through the ATAL portal to eligible participants. The session ended with a vote of thanks.

Outcomes. By the end of the FDP, participants were able to:

1. Explain where XAI, ensemble ML, ANN, computer vision and LLM-based tools fit in civil engineering workflows.
2. Automate structural analysis by scripting SAP2000 through its OAPI in Python.
3. Relate field technologies (drones, digital surveying, BIM, remote sensing, digital twins) to teaching and research problems.
4. Read and critique recent ML-based civil engineering articles.
5. Identify topics for student projects, research proposals and industry collaboration.

Acknowledgements

The organisers thank the AICTE Training and Learning (ATAL) Academy for sponsoring the programme; the Vice-Chancellor, the Registrar and the Director, GTU-SET for their support; Prof. Gaurav Vyas, Dr. K. M. Gondaliya and Prof. Rasik Makwana for continuous support; all resource persons; Protthapan Technologies Pvt. Ltd. for hosting the industrial visit; and the faculty, staff and student volunteers of GTU-SET.

Annexures

Annexure I – Schedule of expert sessions

Day	Date	Session	Resource person	Topic
1	12 Oct 2026	1	Prof. Mridul Seth, GTU-SET	XAI application in defining the influencing parameters for water quality
1	12 Oct 2026	2	Dr. K. M. Gondaliya, GTU-SET	Integration of the OAPI feature of SAP2000 using Python programming
2	13 Oct 2026	3	Mr. Yogesh P. Pathak, RIJA Consultants Pvt. Ltd.	Emerging AI for highway intelligence: NHAI DAMS
2	13 Oct 2026	4	Mr. Parin Shah, Tech Mahindra	AI/ML for information management
3	14 Oct 2026	5	Dr. H. J. Chauhan, BVM Anand	Surveying and mapping using digital instruments
3	14 Oct 2026	6	Dr. Anant Parghi, SVNIT Surat	Seismic response prediction of asymmetric structures with SMA dampers using ML
4	15 Oct 2026	7	Mr. Pranav Suthar, Next Synergy	Application of BIM in projects: case study
4	15 Oct 2026	8	Dr. Harsh Shah, Agrocast Analytics	Tree counting to crop water estimation using AI/ML
5	16 Oct 2026	9	Mr. Rashmikant Thakkar, PMC and Construction Advisory	Emerging AI technologies for civil engineering professionals
6	17 Oct 2026	10	Dr. Lalit Singh, NPCIL-BARC	Development of digital twin for civil engineering

Annexure II – Photographs: Selected photographs of the programme are given below.



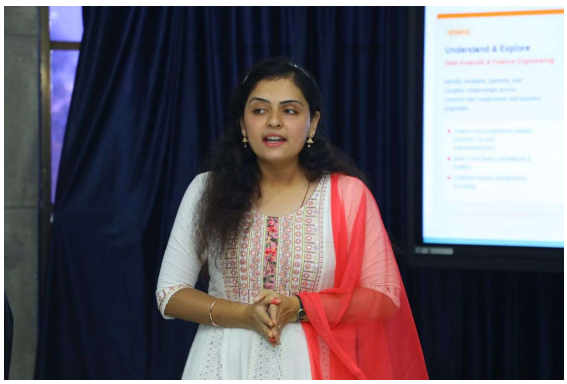
Group photograph of participants, resource persons and organizers



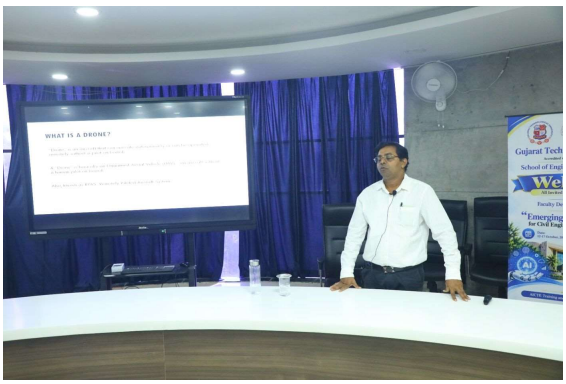
Expert session – data analysis and outlier handling



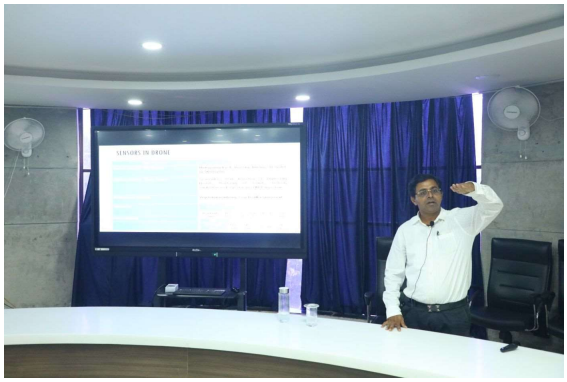
Expert session – OAPI Features of SAP2000



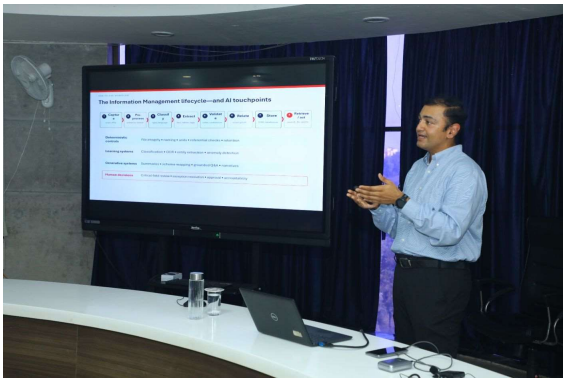
Expert session – data analysis and feature engineering



Session 3 – drone-based highway monitoring (NHAI DAMS)



Session 3 – sensors used in drones



Session 4 – AI/ML for information management



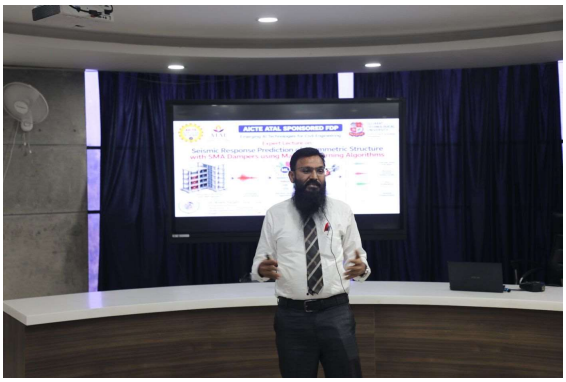
Day 3 – outdoor demonstration of surveying and GNSS equipment



Day 3 – participants during the field demonstration



Session 6 – seismic response prediction with SMA dampers using ML



Session 6 – interaction with participants



Participants attending an expert session



Participants attending an expert session



Valedictory session – dignitaries on the dais



Valedictory session – Dr Madhuri D. Bhavsar, Director, GTU-SET



Feedback session – address by a participant



Valedictory session in the A2-seminar hall