

MANTRA RAVAT

Civil Engineering Student

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CEPT Portfolio

PROFILE

Civil Engineering student who moves easily between hand calculations, software simulation and physical prototypes, and compares all three to see how a design really behaves. Studio work spans structural steel, water networks, GIS analysis, inflatable structures and passive cooling. Drawn to nature-inspired structures and sustainable water infrastructure.

TECHNICAL SKILLS

- Steel design & connection detailing
- Load calculation, SFD & BMD
- Pipe networks (Hardy Cross)
- Hydraulics & head-loss analysis
- GIS multi-criteria analysis
- Climate & passive cooling design
- Kinetic & inflatable structures
- Model making & prototyping

SOFTWARE

WaterGEMS · GIS · Rhino · Grasshopper · SimScale · AutoCAD · 3D Rendering

LANGUAGES

English · Hindi · Gujarati

EDUCATION

BACHELOR OF CIVIL ENGINEERING — 2023 – 2028
CEPT University, Ahmedabad · Faculty of Technology

SCHOOLING — 2017 – 2023
Ananya Vidyalaya

ACADEMIC PROJECTS

RAINWATER HARVESTING POTENTIAL ZONES — Monsoon 2026
Mapping the Civil Systems (CT3022)

- Mapped harvesting zones for Singapore and Chennai with GIS weighted overlay of rainfall, land use, runoff, drainage density and slope.
- Estimated 8.72 million m^3/year of rooftop potential across 16,561 buildings in Singapore's Very High zones.
- Proposed Chennai strategies: rooftop harvesting, community storage, industrial runoff reuse and recharge.

BIO VEIN – MATRIX — Spring 2026
Metallogic: Structural Steel Engineering (CT2029)

- Designed a furniture retail space with a leaf-vein steel frame: a primary spine and branching triangulated trusses.
- Modelled loads, supports and members; studied axial forces, utilisation ratio and deflection.
- Detailed welded SHS joints, truss nodes and base plates; built a physical truss-junction model.

GREY GRID SYSTEM — Monsoon 2025
Network Design for Water Systems (CT2016)

- Designed and built an 8-loop greywater network: one 25 L/min inlet feeding four outlets.
- Compared Hardy Cross hand calculations, a WaterGEMS simulation and flow readings on the physical model.
- Earlier exercises: Bernoulli (SimScale), Pascal's-law crusher, head loss by five equations, notch flow.

HANDS-ON WORK

- 1:1 crank-rocker mechanism
- Origami kinetic roof prototype
- Pascal's-law hydraulic can crusher
- Notch flow channel (rectangular, V, trapezoidal, stepped)
- 8-loop greywater network model
- Steel truss-junction model
- 1:25 desert shelter model

CASE STUDIES

- Apple Stanford store – roof girder SFD & BMD
- Eden Project – air-pressure systems
- Fuji Pavilion – inflatable structure
- Singapore water management

STRENGTHS

- Teamwork in model building
- Iterative design thinking
- Clear technical drawing sheets
- Testing theory against reality

ACADEMIC PROJECTS (CONTD.)

INFLATABLE STRUCTURE: HEALPOD

Spring 2025

Dynamic Systems (CT2034)

- Designed HealPod, a deployable, fully inflatable medical pod for off-grid emergency care in 2040.
- Air-beam structure with seam-welded joinery and durable fabric cladding; even the furniture inflates.
- Developed kinetic concepts: a banana-leaf ETFE shading device and a magnetic PTFE cushion façade.

SCIENCE OBSERVATORY, THAR DESERT

Monsoon 2024

Heat Avoidance: Passive Cooling Technologies (CT2030)

- Designed a three-month shelter for two researchers in Jaisalmer with no mechanical ventilation.
- Climate study (temperature, psychrometric chart, sun path); compared incident radiation, base vs proposed.
- Optimised shading length in Rhino + Grasshopper; studied cross-ventilation and sandstone construction.

LEARNING OUTCOMES

Theory to testing
Checked hand calculations against software and physical measurements, and learned why each gives a different answer.

Structural thinking
Turned natural forms (leaf veins, banana leaves, lungs) into buildable systems with clear load paths.

Water systems
Understood looped network behaviour, flow balancing, head losses and city-scale rainwater planning.

Climate-responsive design
Used climate data and simulation to cut heat gain without mechanical systems.

Making
Learned joinery, friction, alignment and teamwork through full-scale and scaled models.