Mechatronics Department

Report on Industrial Visit to Fine Cast (Gujarat) Pvt Ltd & Unique Forgings (India) Pvt Ltd

Practical Exposure to Advanced Manufacturing Technologies

Date of Visit: 13 th March 2026
Participants: 4th semester Mechatronics Students
Number of participants: 19 students (1st visit) & 26 students (2nd visit)
Accompanying Staff: Prof. Hemant Rathod & Mr. Sanjay Parmar
Location: Vitthal Udyognagar, GIDC Anand, Gujarat

Visit Observations and Outcomes

Introduction

On March 25, 2026, the 2nd-year Mechatronics students of G H Patel College of Engineering & Technology (GCET) under The Charutar Vidya Mandal (CVM) University successfully completed a comprehensive industrial visit to two prominent manufacturing facilities in Anand: Fine Cast (Gujarat) Pvt Ltd and Unique Forgings (India) Pvt Ltd.

The primary objective of this visit was to bridge the gap between classroom theory and industrial practice. By observing heavy-duty casting and forging operations, students gained practical exposure to core Manufacturing Technology concepts, material science applications, and the increasing role of automated control systems in traditional manufacturing environments.

Part 1: Fine Cast (Gujarat) Pvt Ltd (Casting Operations)

The visit commenced at Fine Cast, where plant engineers provided an introductory briefing on foundry safety protocols and the end-to-end metal casting workflow. Students were given a step-by-step tour of the facility:\

- **Pattern and Core Making:** Students observed the preparation of intricate sand molds. The plant engineers explained how patterns are designed with specific shrinkage and draft allowances to ensure dimensional accuracy once the metal cools. The process of core shooting, used to create internal cavities within the cast components, was also demonstrated.
- **Melting and Metallurgy:** A major highlight was witnessing the operation of high-frequency induction furnaces. Students learned about the precise thermodynamic controls required to melt various steel and iron alloys. The engineers demonstrated how optical emission spectrometry is used to test the chemical composition of the molten metal in real-time before pouring, ensuring strict metallurgical standards are met.
- **Pouring and Solidification:** Students observed the highly controlled, mechanized process of transferring molten metal using refractory-lined ladles. The pouring process emphasized the importance of gating systems and risers to prevent casting defects like shrinkage cavities and gas porosity.
- **Fettling and Surface Finishing:** Post-solidification, the tour moved to the fettling shop. Here, the raw castings underwent knockout, shot blasting, and pneumatic grinding. This showcased the physical effort and

Part 2: Unique Forgings (India) Pvt Ltd (Forging Operations)

The second half of the visit took place at Unique Forgings, providing a sharp contrast to the casting process by focusing on the plastic deformation of solid metals.

Die Manufacturing (CNC Machining): Tying back to mechatronics, students first visited the tool room where complex forging dies were being manufactured using advanced CNC Vertical Machining Centers (VMCs). This reinforced how precision electronic controls translate CAD designs into heavy-duty physical tooling.

Billet Heating: The workflow continued at the rotary and pusher-type furnaces, where raw steel billets were heated to temperatures exceeding 1,200°C to reach a plastic, malleable state without melting.

Drop Forging and Press Operations: Students felt the immense ground vibrations as they watched heavy drop hammers and mechanical forging presses in action. They observed how massive compressive forces force the red-hot billets to flow into the closed die cavities. The plant guide explained how this process refines the grain structure of the metal, drastically improving the mechanical strength and fatigue resistance of the final component compared to cast parts.

Heat Treatment: To relieve internal stresses induced during forging, components were subjected to specialized heat treatment cycles. Students observed normalizing and tempering processes, gaining a practical understanding of how controlled cooling rates alter a metal's molecular properties.

Automation and Quality Control (Mechatronics Perspective)

Throughout both facilities, special attention was drawn to the intersection of traditional manufacturing and modern mechatronics. Students noted the use of Programmable Logic Controllers (PLCs) in regulating furnace temperatures, managing conveyor belt speeds, and coordinating pneumatic clamping systems. The visit concluded with a look at non-destructive testing (NDT) methods, such as Magnetic Particle Inspection (MPI) and Ultrasonic Testing (UT), used to detect internal flaws.

Outcome of the Visit for Students

The industrial visit was highly successful, providing vital takeaways for the 4th-semester students:

1. **Bridging Theory and Practice:** Students visually connected theoretical concepts from their Manufacturing Technology syllabus—such as solidification thermodynamics, tooling allowances, and forging mechanics—with real-world industrial execution.
2. **Comparative Material Science:** By experiencing both casting and forging on the same day, students developed a practical understanding of why certain parts (like complex engine blocks) are cast, while high-stress components (like crankshafts) must be forged.
3. **Appreciation for Industrial Scale and Safety:** Witnessing the extreme heat, heavy lifting mechanisms, and intense physical forces in these facilities instilled a profound respect for industrial safety protocols and environmental control systems.
4. **Interdisciplinary Awareness:** Observing the reliance on CNC machining , sensor networks, and automated material handling reinforced that modern heavy manufacturing relies heavily on the seamless integration of mechanical and electronic systems—the core of Mechatronics engineering.

G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY

MECHATRONICS DEPARTMENT

Class: Second Year (Sem IV)
Industry: Fine Cast Pvt Ltd.
Location: GIDC, VU Nagar, 388121.
Date: 13-03-2026
Visit Time: 9:00 AM – 11:00 AM

Sr. No.	Enrollment No.	Name	Signature
1	12402100501001	SPOLIA ASHISH	
2	12402100501002	GAJJAR AXAT DHARMESHKUMAR	
3	12402100501003	SHAH DAKSH NIKUNJ	
4	12402100501004	BHALALA DEEP ALPESHBHAI	
5	12402100501005	SHAH DEVANSH KETANKUMAR	
6	12402100501006	EZHAVA DHIRAJ RAJIV	
7	12402100501007	PADHIYAR DHRUV ALPESHKUMAR	
8	12402100501008	PATEL DHRUV ANILBHAI	
9	12402100501009	DHALIWAL GURKARAN SINGH BALJIT SINGH	
10	12402100501010	CHHATRALIYA HARIT MINESH	
11	12402100501011	DIGHE HARSHANG JITENDRA	
12	12402100501012	PATHAK HRIDAY RITESH	
13	12402100501013	PANDYA JAINEEL YAGNESH	
14	12402100501014	CHAUHAN JAYNEEL SHAILESH	
15	12402100501015	PRAJAPATI KAMLESHBHAI DAHYABHAI	
16	12402100501016	KAHODARIYA KARTAVYA MAHESHBHAI	
17	12402100501017	AGRAVAT KAUSHAL SAMIRBHAI	
18	12402100501018	HINGU MANAV SANJAYKUMAR	
19	12402100501019	PATEL MANUJ RAKESHKUMAR	
20	12402100501020	SHAH MARMIK JAYESH	
21	12402100501021	GHORI NEMIS HITESHBHAI	
22	12402100501022	PATHAN NIHALKHAN SAMIRKHAN	
23	12402100501023	LALVANI PARTH ASHOKBHAI	
24	12402100501024	PATEL PRATHAM RAJESHBHAI	
25	12402100501025	KALATHIYA PURV PARESHBHAI	
26	12402100501026	PATEL RAJAT TARUNKUMAR	

27	12402100501027	CHRISTI RISHIT ANANTKUMAR	
28	12402100501028	TAILOR RISHIT DIVYESH	
29	12402100501029	PATEL SLOK JIGNESH	
30	12402100501030	SUKHADIYA VAIDIK MANISH	
31	12402100501031	PATEL VIDIT	
32	12402100501032	PARTE KRUNAL RAJENDRA	
33	12402100501033	PARTHIV SANJAYBHAI DHOLARIYA	
34	12502100503001	PATEL AMAN JITENDRABHAI	
35	12502100503002	RAJESHIRKE DEVANG MANOJ	
36	12502100503003	MEHTA KUNJ JITENDRABHAI	
37	12502100503004	MOHAN CHANDRAKANT PATEL	
38	12502100503005	SAIYED MOHMADARKAM GULREJAHMEAD	
39	12502100503006	PARMAR VISHWA NITINBHAI	
40	12502100503007	PATEL DHYEYKUMAR ASHOKBHAI	
41	12502100503008	PATEL PARASHAR MEHULKUMAR	
42	12502100503009	MEHTA SHYMAL KULDIP	

Faculty In-charge: _____

Signature: _____

Lab Assistant: _____

Signature: _____

G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY

MECHATRONICS DEPARTMENT

Class: Second Year (Sem IV)
Industry: Unique Forging Pvt Ltd.
Location: GIDC, VU Nagar, 388121.
Date: 13-03-2026
Visit Time: 3:00 PM – 05:00 PM

Sr. No.	Enrollment No.	Name	Signature
1	12402100501001	SPOLIA ASHISH	
2	12402100501002	GAJJAR AXAT DHARMESHKUMAR	
3	12402100501003	SHAH DAKSH NIKUNJ	
4	12402100501004	BHALALA DEEP ALPESHBHAI	
5	12402100501005	SHAH DEVANSH KETANKUMAR	
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19	12402100501019	PATEL MANUJ RAKESHKUMAR	
20	12402100501020	SHAH MARMIK JAYESH	
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