VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELAGAVI- 590 018

Report

on

INNOVATION AND DESIGN THINKING LAB

BIDTP158

Submitted in Partial Fulfillment for the Award of Degree of

Bachelor of Engineering

in

CSE(AI&ML)

Submitted by

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Y Rahul Yadav(1RN25CI298-T)

GIUDE

Prof. Shwetha Satyendra

Assistant Professor

DEPARTMENT OF CSE(AI&ML)

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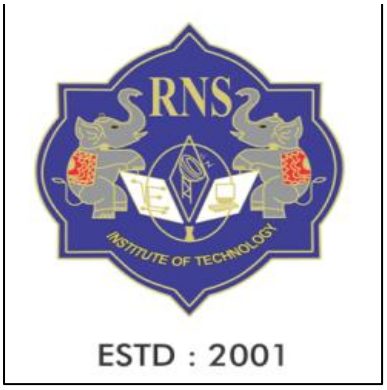

CERTIFICATE

This is to certify that the **INNOVATION AND DESIGN THINKING LAB- BIDTP158**

has been successfully carried out by **Subhransu Nayak** bearing **USN: 1RN25CI219-T, Raghav Bubna** bearing **USN: 1RN25CI242-T and Y Rahul Yadav** bearing **USN: 1RN25CI298-T** Bonafide I semester student of **RNS Institute of Technology** in partial fulfillment of the requirements for the award of degree of **Bachelor of CSE(AI&ML) Engineering** of **Visvesvaraya Technological University, Belagavi** during 2025-26. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report. The **INNOVATION AND DESIGN THINKING LAB (BIDTP158)** report has been approved as it satisfies the academic requirements for the said degree.

……	**……..…**
Guide	**Program coordinator**
Prof. Shwetha Satyendra	**Dr. Chandana C**
Assistant Professor	**Assistant Professor**
Dept. CSE(AI&ML)	**Dept. CSE(AI&ML)**

Examiner: (Name and Signature)

1) **…….**
2) **…….**

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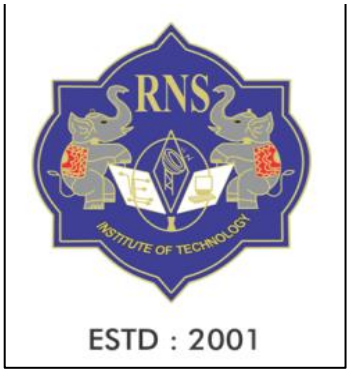

DECLARATION

I, **Subhransu Nayak** bearing **USN: 1RN25CI219-T, Raghav Bubna** bearing **USN: 1RN25CI242-T and Y Rahul Yadav** bearing **USN: 1RN25CI298-T** students of **Bachelor of Engineering** in **CSE(AI&ML) Engineering** at RNS Institute of Technology, Bengaluru, hereby declare that the **Innovation and Design Thinking Lab (BIDTP158)** work has been carried out by me under the supervision and guidance of Department Guide submitted by me as a partial fulfillment for the award of Bachelor of Engineering degree in CSE(AI&ML) Engineering from Visvesvaraya Technological University, Belagavi during 2025-26. I also declare that, this work has not been submitted previously for the award of any degree or diploma, by me, to any institution.

Subhransu Nayak	**(1RN25CI219-T)**
Raghav Bubna	**(1RN25CI242-T)**
Y Rahul Yadav	**(1RN25CI298-T)**

ACKNOWLEDGEMENT

I want to profoundly thank the Management of **RNS Institute of Technology** for providing me such a healthy environment for the pursuing this work.

I would like to thank **Dr. MK Venkatesha**, Director, RNS Institute of Technology, for providing me an opportunity to carry out this work.

I am grateful to **Dr. Ramesh Babu H S**, Principal, RNS Institute of Technology for providing me excellent facilities and academic ambience for carrying out this work at RNSIT.

I express my thanks to **Dr. Andhe Pallavi**, Prof. & HoD, **CSE(AI&ML)** Dept. for **her** valuable support.

I sincerely acknowledge and thank the support extended by **Prof. Shwetha Satyendra** Department Guide during the execution of Innovation and Design Thinking Lab (BIDTP158).

Finally, I take this opportunity to extend my gratitude and respect to my parents, teaching and non-teaching staff of the Department and all my friends who have directly or indirectly supported me during the period of my Innovation and Design Thinking Lab (BIDTP158).

Subhransu Nayak

Raghav Bubna

Y Rahul Yadav

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INTRODUCTION

Our team of three students visited a local granite shop to understand the real-world challenges in manufacturing and cutting operations. We conducted interviews with both the shop owner and an experienced granite cutter to gain insights into their daily work.

This case study explores the technical, safety, and business challenges inherent in the granite industry, combining our firsthand observations with industry research.

OBJECTIVES OF THE VISIT

□ Understanding Industrial Design Processes: To analyse how raw granite blocks are transformed into finished architectural products, focusing on the step-by-step workflow from cutting and grinding to final polishing.

□ Observing Operational Innovation: To identify the technological advancements and machinery used in the shop—such as CNC machines or waterjet cutters—and understand how these innovations improve precision and reduce material waste.

□ Learning User-Centric Thinking: To evaluate how the manufacturing process responds to client specifications and ergonomic needs, ensuring that final installations (like countertops or flooring) meet both aesthetic and functional user requirements.

□ Connecting Academic Theory to Industry Practice: To bridge the gap between classroom knowledge of geology and material science with the real-world physical properties and handling of stone in a high-intensity production environment.

□ Assessing Workplace Safety and Efficiency: To observe how safety protocols (e.g., dust management and heavy lifting procedures) and lean manufacturing principles are implemented to maintain a productive and secure workspace.

□ Exploring Sustainability in Manufacturing: To examine the methods used by the shop to manage water recycling and stone scrap, aiming to understand the environmental impact of large-scale stone processing.

ORGANIZATION DETAILS

Adress: 135, Kengari Road, Uttarahalli, Purna Pragnya, Bengaluru, Karnataka 560061

OBSERVATIONS AND LEARNINGS

Main Findings: What Was Seen and Learned

- **Precision Engineering: The shop utilizes heavy-duty machinery (CNC machines and waterjet cutters) to achieve millimetre-level precision. This highlights the importance of technical accuracy in industrial manufacturing.**
- **Material Limitations: Learning that natural granite has unique "grain" and structural weaknesses. Designers must respect these physical properties to prevent cracking during the fabrication process.**
- **Safety Interdependence: Witnessing how safety protocols (dust extraction systems and heavy lifting cranes) are not just about compliance but are critical to the shop's operational continuity.**
- **Customization vs. Efficiency: Observing the balance between bespoke customer requests (unique edge profiles) and the need for standardized manufacturing speeds to maintain profitability.**

Design Thinking Concepts in Action

- **Empathy:**
    - **In Action: Fabricators spent time understanding the installers and homeowner's perspective.**
    - **Application: They considered how a heavy countertop would be maneuverer through tight staircases or how a user would**

feel the texture of the stone daily, leading to more rounded, "user-friendly" edges.

Ideation:

- **In Action: When faced with a slab containing a natural fissure (flaw), the team brainstormed ways to work around it.**
- **Application: Rather than discarding the slab, they ideated creative layout patterns to use the "flaw" as a natural feature or to cut the pieces in a way that the defect was eliminated while maximizing material yield.**

- **Prototyping:**
  - **In Action: Use of physical templates and digital "mock-ups."**
  - **Application: Before cutting expensive stone, the shop created 1:1 scale wood or plastic templates of the kitchen space. This "low-fidelity" prototype ensures the fit is perfect before the permanent, high-cost "final product" is manufactured.**
- **Testing:**
  - **In Action: The "Dry Fit" phase.**
  - **Application: Finished pieces were laid out on the shop floor to check seam alignment and colour matching across different slabs. If a seam was too visible or the pattern didn't**

flow, the pieces were refined before leaving the shop—serving as a final validation step against user expectations.

DESIGN THINKING MAPPING

Stage	Shop Visit Application
Empathize	**Understanding client lifestyle needs and site-specific constraints (lighting/space).**
Define	**Converting aesthetic "wants" into technical specs (stone type, thickness, edge profile).**
Ideate	**Mapping templates onto raw slabs to maximize material use and align stone veins.**
Prototype	**Creating full-scale wood or plastic "dummy" templates to verify fit before cutting.**
Test	**Performing a "Dry Fit" layout on the shop floor to check seams and colour matching.**

REFLECTIONS AND OUTCOMES

The visit to the granite manufacturing shop shifted the perspective from seeing stone as a static material to seeing it as a medium for high-tech engineering. Below are the key personal insights gained from the experience:

Inspiration: The Human-Machine Partnership

The most inspiring aspect was the synergy between traditional craftsmanship and modern technology. Seeing a master fabricator use their sense of touch to check a polish that was just executed by a multi-axis CNC machine was a powerful reminder that "innovation" isn't about replacing humans, but about augmenting human skill to achieve perfection.

New Skills & Competencies

- **Spatial Visualization: Developed a better ability to visualize how a 2D digital drawing (CAD) translates into a 3D physical object with weight and volume.**
- **Material Intelligence: Gained a foundational understanding of "Geological Design"—learning how to read the grain and mineral composition of a stone to predict how it will behave under stress.**
- **Process Mapping: Improved the ability to break down a complex, high-stakes manufacturing workflow into distinct, manageable stages of the Design Thinking cycle.**

Changing Perceptions

- **On Innovation: Previously, I viewed innovation as "newness" or "software." This visit redefined it as problem-solving within**

constraints. Using a waterjet to save 10% more material from a slab is just as "innovative" as a new app.

- **On Creativity: I learned that creativity in manufacturing is often "invisible." It exists in the clever way a technician hides a seam or the way they pivot when a natural stone reveals a hidden crack. It proved that creativity is not just about the final look, but the ingenuity of the process.**

Conclusion & Acknowledgment –

Personal Insights & Reflections

- **Inspiration: I was struck by the human-machine synergy. Seeing a technician use a digital laser for precision, followed by a hand-feel test for quality, proved that technology doesn't replace craftsmanship—it empowers it.**
- **New Skills: I developed material intelligence, learning to "read" stone grain to predict structural integrity. I also gained technical literacy in how CAD designs translate into physical CNC machine paths.**
- **Perception of Innovation: I previously saw innovation as "new gadgets." Now, I view it as process efficiency, such as water-recycling systems and waste-reduction techniques that solve real-world environmental and economic problems.**
- **Perception of Creativity: This visits redefined creativity as problem-solving under pressure. Designing around a natural crack in a multi-thousand-dollar slab requires more ingenuity than working with limitless resources.**

References / Annexure

Interview Questions: -

1. **Health Problems faced during cutting of Granites.**
2. **How do they face the problems during cutting of Granites?**
3. **How do they tackle the transportation problem?**