

**Institute of Engineering and Management
Department of Basic Sciences and Humanities
Engineering Graphics and Design (ESCME 192)**

Title: 3D printed pen holder

ABSTRACT

This project revolves around the conceptualization, design, and implementation of a versatile 3D printed pen holder. Leveraging the capabilities of 3D printing technology, the pen holder is meticulously crafted to cater to diverse user preferences and requirements. The design process involves CAD modeling, ensuring both aesthetic appeal and functional efficiency. The use of PLA filament as the printing material guarantees durability and ease of customization. The pen holder serves not only as a practical organizational tool but also as a showcase of the innovative potential of 3D printing in crafting everyday objects. The project explores the intersection of creativity, functionality, and modern manufacturing techniques, showcasing the seamless integration of design thinking and technology in the creation of a practical yet visually appealing 3D printed pen holder.

TEAM MEMBERS

Satabarto Sarkar –

E_51

Debangshu Chatterjee –

E_50

Devarshi Gucchait –

E_53

Soumili Mukherjee –

E_37

Suranjana Mondal –

E_42

Mohit Shaw –

E_21

Supervisor: Rimjhim Majumdar

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INTRODUCTION :

This project delves into the realm of additive manufacturing, specifically focusing on the creation of a 3D printed pen holder. Pen holders, though seemingly mundane, serve as essential accessories on desks and workspaces, showcasing an opportunity to blend utility with aesthetic appeal.

The utilization of 3D printing technology introduces a paradigm shift in the traditional methods of crafting such everyday objects. By leveraging Computer-Aided Design (CAD) tools and the precision of 3D printing, we embark on a journey to reimagine the pen holder, transforming it from a conventional tool into a customizable and visually striking piece.

This report navigates through the design process, material selection, and the intricacies of 3D printing technology employed to bring the envisioned pen holder to life. Beyond its utilitarian function, this project explores the potential of additive manufacturing to revolutionize the creation of commonplace items, offering a glimpse into the synergy between modern design principles and cutting-edge manufacturing techniques.

OBJECTIVES

The primary objective of the 3D printed pen holder include:

- Innovation in Design: Develop a pen holder with a unique and innovative design that goes beyond traditional manufacturing constraints, leveraging the freedom offered by 3D printing technology.
- Customization: Enable users to personalize their pen holders by offering a range of design options, allowing for individual expression and adaptation to diverse preferences.
- Material Selection: Investigate and select an appropriate 3D printing filament, emphasizing durability, eco-friendliness, and ease of use in the context of a pen holder.
- Functional Efficiency: Ensure the pen holder not only serves its primary purpose of organizing writing instruments but also addresses practical aspects such as stability, accessibility, and adaptability to different pen sizes.
- Demonstration of 3D Printing Technology: Showcase the application of 3D printing in the creation of everyday objects, emphasizing its role in rapid prototyping, customization, and small-scale manufacturing.

METHODOLOGY

Creating a 3D printed pen holder using AutoCAD involves several steps.

Launch AutoCAD on the computer. Set the drawing units to millimeters to ensure precision in the design. Used the "UNITS" command and choose millimeters. Started a new drawing using the "NEW" command. Used the "RECTANGLE" command to draw a rectangle with dimensions 6.9 × 6.9 cm as the base of the pen holder. Used the "EXTRUDE" command to give your base height, making it 8.5 cm tall. Used lines, rectangles, or circles to create compartments for holding pens. Ensure they are evenly

spaced and appropriately sized within the base. Used the “EXTRUDE” command again to give height to the pen compartments. Entered the desired height for the compartments. Carefully reviewed the 3D model to ensure it aligns with your design intentions. Made necessary adjustments. Saved the AutoCAD drawing in a format compatible with 3D printing, such as .STL or .OBJ.

Opened the saved file in slicing software (PrusaSlicer) to prepare it for 3D printing. Configured the printing settings in the slicing software, specifying layer height, infill, supports, and other parameters based on your printer and filament. Then we generated G-code in the slicing software, which contains instructions for your 3D printer. Load the chosen filament into the 3D printer. Started the 3D printing process using the generated G-code. After printing was complete, carefully removed the pen holder from the build plate. Cleaned up the rough edges using appropriate tools and ensured pens fit securely into the holder. Made the final adjustments which were necessary.

By following these steps, you should be able to create a 6.9 × 6.9 × 8.5 cm 3D printed pen holder using AutoCAD.

RESEARCH AND ANALYSIS

Research and analysis in 3D printing of a pen holder involves studying design considerations, material options, and printing technologies. Consider factors like durability, aesthetics, and functionality in your design. Materials like PLA and ABS are common, and FDM or resin printing may be suitable. Test prototypes to assess structural integrity and refine the design for optimal performance.

IDEATION AND CONCEPT DEVELOPMENT

For ideation and concept development of a 3D printed pen holder, consider the following steps:

- Define Purpose: Clearly outline the purpose of the pen holder – whether it’s for a desk, wall-mounted, portable, or multifunctional.
 - User-Centered Design: Understand user needs and preferences. Factors like pen size, quantity, and additional features should be considered.
 - Sketching and Brainstorming: Begin with rough sketches of potential designs. Brainstorm ideas for unique shapes, patterns, or features that could enhance both form and function.
 - Functional Features: Incorporate features like pen slots, additional compartments, or integrated accessories. Ensure these elements enhance usability.
 - Aesthetic Considerations: Explore various aesthetic styles that align with the intended use and user preferences. Consider color options and surface textures.
 - Prototyping: Create simple prototypes to visualize the design in 3D space. This can be done using modeling software or physical prototypes made from simpler materials.
 - Iterative Refinement: Gather feedback on the prototypes, iterate on the design, and refine it based on usability and aesthetics. Ensure the design is practical for 3D printing.
 - Material Selection: Choose an appropriate 3D printing material based on the desired characteristics (e.g., PLA for a balance of strength and ease of printing).
- Printing Technology:

Decide on the 3D printing technology (e.g., FDM, SLA) based on your design requirements and available resources.

PROTOTYPE DEVELOPMENT

Clearly outlined what features we wanted in the holder, such as pen stability, adjustable angles, and material preferences. Created rough sketches of your holder, considering dimensions and how the 3D printing pen will fit.

Used 3D modeling software- AutoCAD to create a digital representation of your design. Ensured it's compatible with 3D printing. Choose a suitable 3D printing material based on durability and stability requirements.

Printed our design using a 3D printer. Adjusted settings like layer height and infill density based on our requirements. Put together the printed parts, ensuring they fit seamlessly. Test the functionality and make adjustments if necessary.

Create documentation detailing the assembly process and any specific instructions for using the 3D printing pen holder.

Testing and Evaluation

To test and evaluate the 3D printed pen holder, consider factors like durability, compatibility with various pen sizes, stability, and aesthetics. Conducted user trials to gather feedback on functionality and ergonomic aspects. Additionally, assess the printing quality and material used for any defects or weaknesses.

Conclusion

In conclusion, the 3D printed pen holder proved to be a practical and customizable solution for organizing pens, contributing to improved workspace efficiency and reduced clutter. Its impact extends to potential ergonomic benefits and the broader scope of fostering innovation within the 3D printing community.

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