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| 1.0 | Initial | Atharva Bhosale | 2025-06-20 |

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# Subject

A pen plotter is a type of computer-controlled device that uses pens or markers to create precise and accurate drawings on paper. This project aims to develop a functional pen plotter using specific components and technologies that showcases the integration of hardware, software, and mechanical components to achieve a specific task.

This document presents the Bill of Materials (BOM) for the pen plotter developed and fabricated by us as a part of our Workshop Mechatronics project. This product combines hardware, software, and mechanical components to create precise and accurate drawings on paper.

The BOM serves as a comprehensive inventory list, detailing the specific components and technologies utilized in the construction of the pen plotter, highlighting their crucial role in achieving the desired functionality and performance.

The Bill of Materials presented in this document provides a comprehensive inventory of the key components and technologies employed in the construction of the pen plotter.

These carefully selected components and technologies are instrumental in achieving the precise and accurate drawing capabilities of the pen plotter, showcasing its exceptional functionality and performance.

# Bill of Material

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Bill of Materials** | | | | | | | | | |
|  | | | | | | | | | |
| Item | Description | Material | Source | QTY | Measurement | Unit Price | | Total Price | |
| Mechanical Components | | | | | | | | | |
| M01 | Pulley 2GT | Aluminium | Temu | 5 | piece | € 1,15 | | € 5,76 | |
| M02 | Heat Set Inserts | Steel | Temu | 200 | piece | € 0,025 | | € 4,45 | |
| M03 | Neodymium Magnet | Magnet | Conrad | 1 | piece | € 6,99 | | € 6,99 | |
| M04 | Ball Bearing | Steel | Conrad | 2 | piece | € 1,29 | | € 2,58 | |
| M05 | Geared Pulley | Steel | University | 2 | piece | € 0,20 | | € 1,00 | |
| M06 | 3D Printed Feet | PLA | University | 4 | piece | € 0,10 | | € 1,20 | |
| M07 | Belt | Rubber | University | 1 | meter | € 0,20 | | € 2,40 | |
| M08 | Smooth rods 6mm | Steel | University | 4 | meters | € 0,15 | | € 1,50 | |
| M09 | Cable ties | Plastic | Hellweg | 100 | piece | € 0,025 | | € 2,50 | |
| M10 | Super Glue | Glue | Tedi | 1 | piece | € 1,00 | | € 1,00 | |
| M11 | M3 \*20mm | Steel | Hellweg | 16 | piece | € 0,211 | | € 3,39 | |
| M12 | M3 \*10mm | Steel | Hellweg | 16 | piece | € 0,19 | | € 3,19 | |
| M13 | M3 Nuts | Steel | Hellweg | 20 | piece | € 0,018 | | € 3,79 | |
| M14 | M4 washers | Plastic | Hellweg | 25 | piece | € 0,079 | | € 1,99 | |
| M15 | M4 Screws | Steel | University | 4 | piece | € 0,00 | | € 0,00 | |
|  | | | | | | | **Subtotal** | | **€ 41,74** |
| Electrical Components | | | | | | | | | |
| E01 | Bread Board |  | University | 2 | Piece | € 0 | | € 0 | |
| E02 | Connect Socket Strip |  | Conrad | 12 | Piece | € 0,29 | | € 3,48 | |
| E03 | Dupont Connector Kit |  | Berrybase | 1 | Piece | € 14,85 | | € 14,85 | |
| E04 | Motor Driver |  | University | 1 | Piece |  | |  | |
| E05 | ESP32 Development board |  | University | 1 | Piece |  | |  | |
| E06 | TT Motor Encoder |  | University | 2 | Piece |  | |  | |
| E07 | Servo motor |  | University | 2 | Piece |  | |  | |
| E08 | Cable for Motor Driver |  | University | 1 | Piece |  | |  | |
| E09 | Cable for Power Supply |  | University | 1 | Piece |  | |  | |
| E10 | Jumper cables |  | University | 1 | Piece |  | |  | |
| E11 | DC Motor |  | University | 2 | Piece |  | |  | |
| E12 | Power Supply Unit |  | University | 1 | Piece |  | |  | |
| E13 | Hall Effect Sensor |  | University | 1 | Meter |  | |  | |
| E14 | Microswitch RED |  | University | 4 | Piece |  | |  | |
| E15 | Adaptor 12V |  | Amazon | 1 | Piece | € 15 | | € 15 | |
| E16 | Limit Switches |  | Univesity | 4 | Piece |  | |  | |
| E17 | Perfboard |  | Conrad | 1 | Piece | € 2,49 | | € 2,49 | |
|  | | | | | | | **Subtotal** | | **€ 35,82** |
| 3D Printed Components | | | | | | | | | |
| P01 | Encoder Wheel | PLA | University Lab | 4 | Piece | € 1,00 | | € 2,00 | |
| P02 | GT2 15T Motor Pulley | PLA | University Lab | 2 | Piece | € 1,00 | | € 2,00 | |
| P03 | Carriage | PLA | University Lab | 1 | Piece | € 5,0 | | € 5,00 | |
| Item | Description | Material | Source | QTY | Measurement | Unit Price | | Total Price | |
| P04 | Pulley Tensioner | PLA | University Lab | 1 | Piece | € 6.00 | | € 6,00 | |
| P05 | Motor Support Fixture | PLA | University Lab | 2 | Piece | € 11.00 | | € 22,00 | |
| P06 | Pen Holder Fixture | PLA | University Lab | 1 | Piece | € 8.00 | | € 8,00 | |
| P07 | Base Plate | PLA | University Lab | 1 | Piece | € 20.00 | | € 20,00 | |
| P08 | Pulley Tensioner | PLA | University Lab | 1 | Piece | € 16.00 | | € 16,00 | |
|  | | | | | | | **Subtotal** | | **€ 61** |
| **Grand total** | | | | | | | | | **€ 138.56** |

# Conclusion

The total cost of manufacturing the pen plotter is approximately 175 euros, which is significantly less than the permitted cap of 200 euros and in accordance with User requirements.

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