Project Presentation

Sinhgad Institutes

"PARAMETRIC DESIGN AND ANALYSIS OF MACHINE ELEMENTS USING PYTHON"

C-298	Yash Ramchandra Sarda	71939582J
B-118	Prasad Suresh Jagdale	71939503J
C-244	Harshal Dattatraya Sawant	71939558F
B-111	Ishan Anand Prabhune	71939502L
	Guided by :- Dr.S.S.Mulik Sir	

Department of Mechanical Engineering

RMD- Sinhgad, Pune

2020-21

Agenda

- **Introduction**

- **Problem Statement.**

- **Objectives.**

- **Methodology.**
    1. Tools and Software Used.
    2. Elements implemented.

- **Screen Shots of project.**

- **Advantages.**

- **Summary.**

- **References.**

Introduction

As everything is moving towards Automation we got idea to automate our design works. With the help of Python and its modules we are trying to make the tired and time consuming work easy and finish within just some few minutes.We also had added functionality to plot the Shear Force and Bending Moment diagram or to save it as an image as user want which could be used to further analyse.It is an awesome opportunity to integrate our knowledge of 3 years of engineering with the computer programming.

Problem Statement

- In the era of technology everything is moving towards Automation.

- We thought that designing and analysis must also be automated to save time and money of brilliant engineers and designers.

- As when we were learning the CATIA and AutoCAD. We realised what hard work, determination and time it requires.

- So we are making a demo type model of Automation of design software and also doing analysis of designed elements

- To save time for designing.
- To save time for calculations.
- To automate the designing process.
- To make the work of Engineers easy.

Sinhgad Institutes

- Python → Programming language.
- AutoCAD → Design Software.
- Pandas → To store & retrieve data. Database.
- VS Code → TO Write Python Programs.

Modules : They are Small Program inbuilt in Python to enhance the functionality of Python Programs.

- 1) Math → To perform Mathematical Function

- 2) Matplotlib → To Plot Graphs, SFD, BMD.

- 3) Turtle → A Drawing Module of Python to plot CNC Drawing.

- 4) Tkinter → An API (Application Programming Interface) to create GUI (Graphical User Interface).

- 5) PyAutoCAD → An API to send commands to AutoCAD from Python.
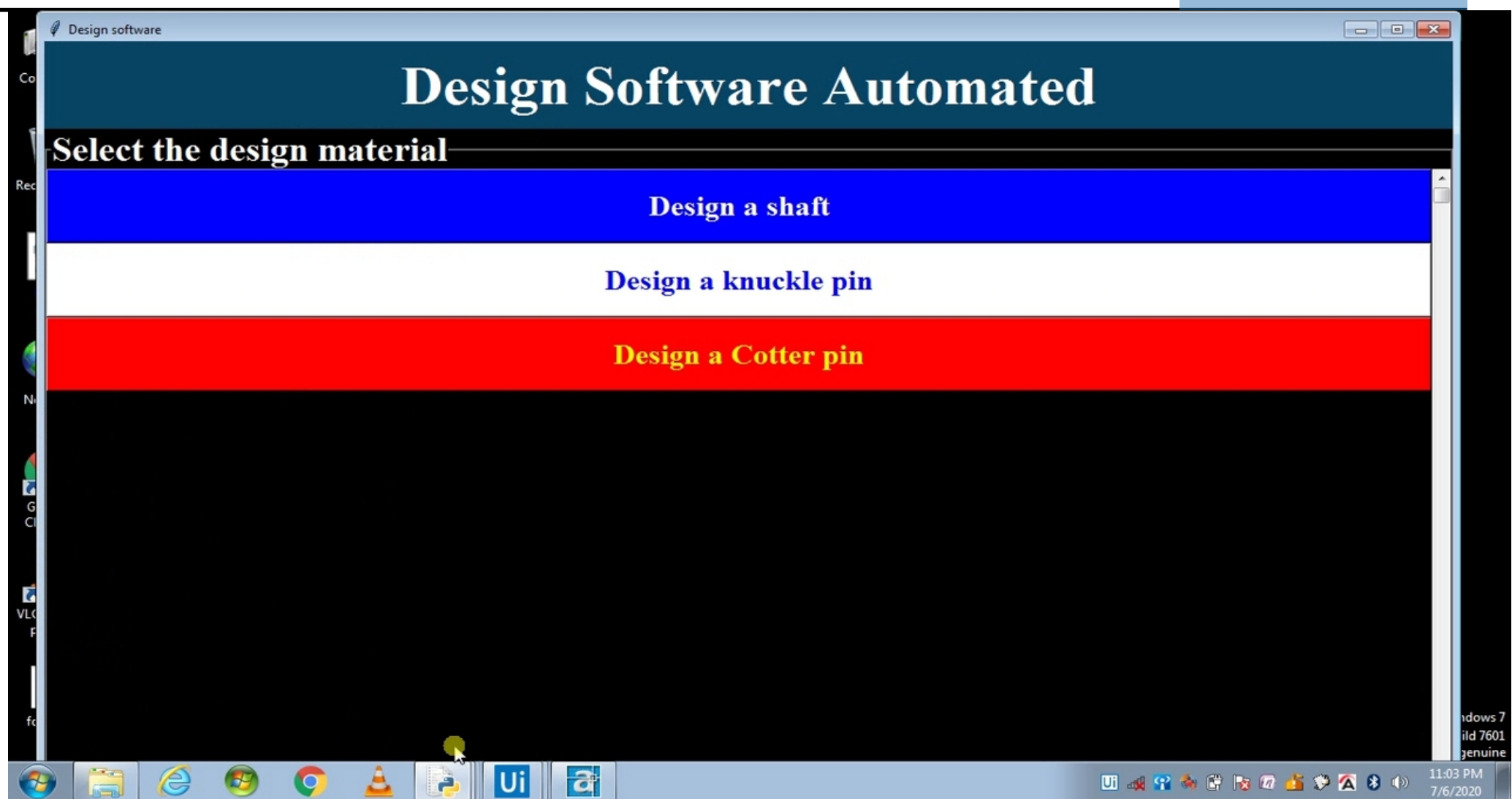
Elements implemented

- In our project We had chosen 3 elements to design.

1) Cotter Pin

2) Knuckle Pin

3) Shaft

Some extras..

- We had also made the program of plotting the diagram before going to CNC MACHINE by writing or giving same code of CNC machine.

- We had implemented absolute programming for easy reference of points.

- For it we had to use Turtle software which would convert the Python code in 2D diagram in Cartesian Coordinate system.

- We had used Absolute Programming Method.

Some Screen Shot of our project

Example: Problem of knuckle pin

Sinhgad Institutes

Dimensions of your Design Pin

Power Given	20000.0N
Factor of Safety Selected	2.5

Forces given
Shear Yield Strengrth: 200.0N
Shear compression Strengrth: 240.0N
Shear Stress: 100.0N

Diameter of rod	18.84mm
Diameter of Knuckle Pin	19mm
Thickness of single eye	24.55mm
Thickness of Fork	15.13mm
Outside Diameter of Eye	40.37mm

Analysis of failure of fork end in tension and shear
Analysis of failure of fork end in tension
Since st = 30.93N/mm2 < 80.0N/mm2
                    Hence Fork End is safe against Tensile Failure

Now analysis of Fork End in Shear

Since st = 30.93N/mm2 < 40.0N/mm2
                    Hence Fork End is safe against Shear Failure
Do you want this dimension in word file or pdf file. Then press the below button to get data

Get Dimension to the file

Sinhgad Institutes

DESIGN OF SHAFT

- Design Solid Shaft

- Design Hollow Shaft

- Compare Hollow & Solid Shaft for Same parameters

Design of Solid Shaft.
Plese enter following details to get the design of Solid Shaft

Power to be Transmitted P　　　　　　20000

Load on Shaft W　　　　　　0

Enter Rpm .
If you don't know please leave it blank or type 0　　　　200

Enter Length .
If you don't know please leave it blank or type 0　　　　0

Enter Faactor of Safety.
If you don't know please leave it blank or type 0　　　　1

Enter Bending Stress .
If not applicable please leave it blank or type 0

Enter Shear Stress Strength of material.
**If you don't know please leave it blank or type 0**　　　60

Enter Torque excedence %.
If you don't know please leave it blank or type 0

[☐Design the Shaft for above parameters]

Torque Ratio given   0.0%

Power Given   20000 Watt

Load Given   N

Factor of Safety Given   1

Rotation / minute (Rpm)   200rpm

Max Twisting Moment   954.929658551372 - 954.929658551372 N-m

Max Bending Moment   0.0 - 0.0 N-m

Shear Stress considered   60.0N/mm^2

Bending Stress considered   0.0N/mm^2

Diameter of Shaft   45mm

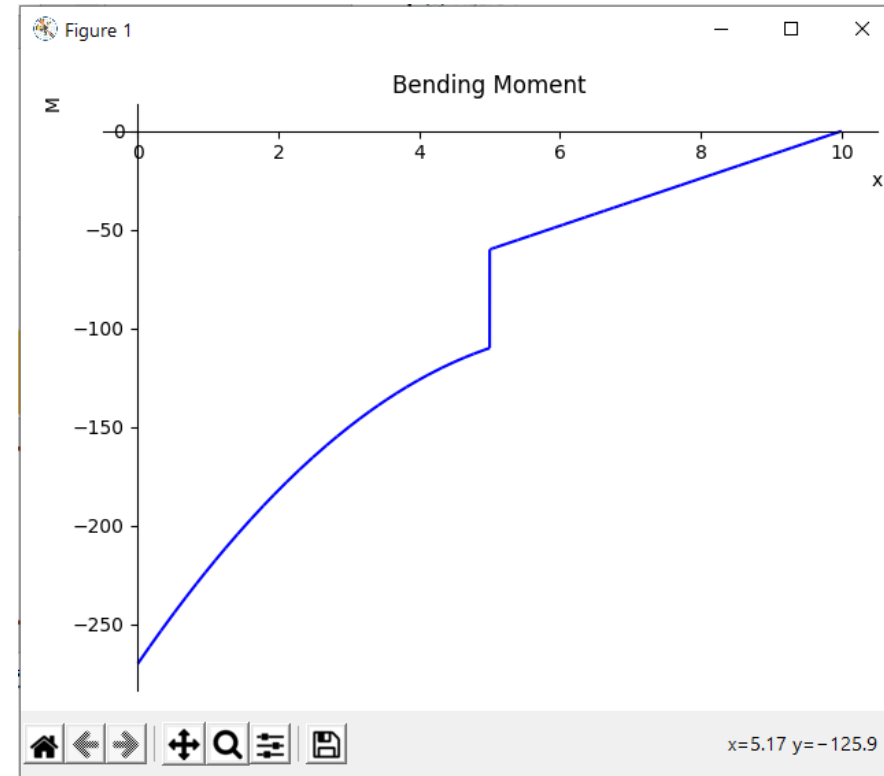**Mass of Cylinder for 1 m length**   1162.1 g

Do you want this dimension in word file or pdf file. Then press the below button to get data

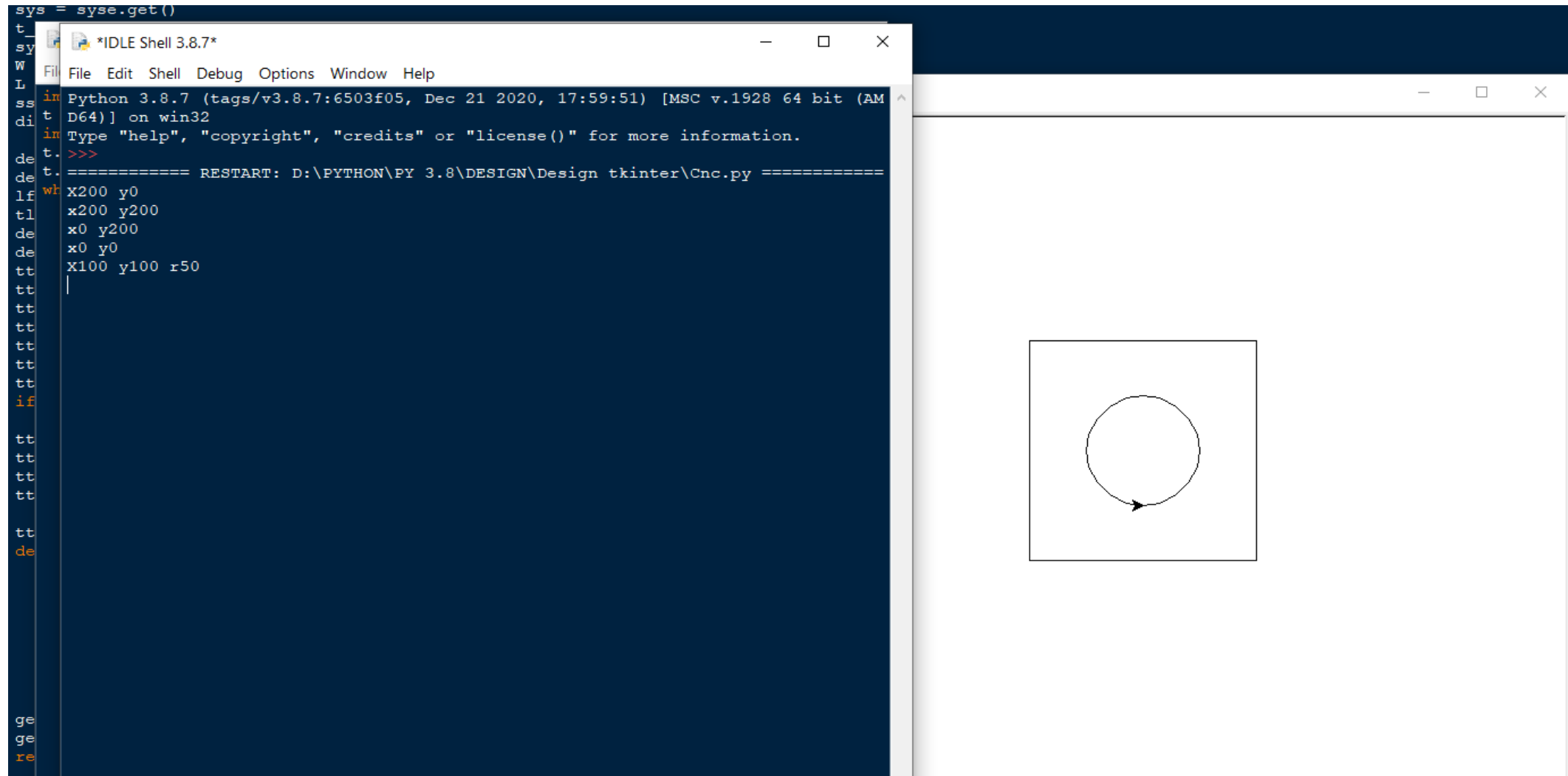Get Dimension to the file

Shear Force Diagram
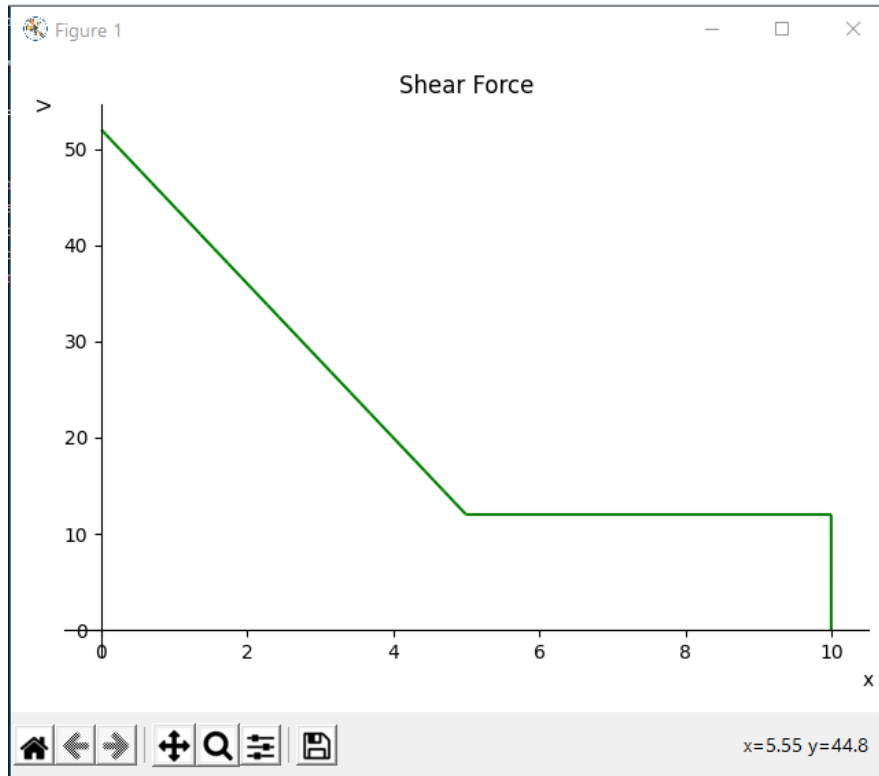
Bending Moment Diagram

CNC Demo with coordinates on left side while output on right side

Advantages

- Easy to use.

- Easy to implement.

- Save time.

- Quick and correct analysis.

- Wide range of applications.

- No headache of lengthy and complex calculations.

Summary

We had done this project to enhance our process of designing a step forward. With this we are trying to make the design process less tired and time consuming from previous headache one. We are also trying to implement some theories of thermodynamics to make our model more better. Though we had done much progress in recent few decades but in a world, moving towards Automations why design process should be a complex one in today's era ?

References

- www.python.org/docs.com
- www.github.com
- https://pypi.org/project/pyautocad
- https://pyautocad.readthedocs.io
- https://www.youtube.com