Mahatma Education Society's

Pillai College of Engineering, New Panvel

REPORT ON MINI-PROJECT-1A (MEPBL301 & AEPBL301)

Department of Mechanical and Automobile Engineering

2020 - 2021

CLASS: SECOND YEAR **SEMESTER:** III **SCHEME:** R2019 (REVISED C SCHEME)

The Revised 'C' scheme (R2019) formally took effect for second year engineering students of Mechanical and Automobile engineering departments of Mumbai University this year (2020-2021), and the Project Based Learning (PBL) which was introduced in our institute in the academic year 2016-2017 and running successfully as an added course to cater to the enhanced learning of the students, was inducted as a separate mandatory course in the syllabus, under the name: **Mini-Project-1A**. This report highlights the summary of the course conducted in the semester III of the present academic year.

Students were instructed at the start of the semester, to form groups of 3-4 students each for the mini project. They were shortly later introduced to the topics. 3 topics were floated and students were instructed to select one of them. Ample time of about a week was given to identify their choice. Since the lockdown was in effect due to the deadly coronavirus pandemic, topics were to be identified to enable the students to work comfortably from their homes. This was a challenge, and difficult for the faculty designing the topics, particularly since the students were mostly undertaking projects requiring some sort of fabrication or manufacturing/construction requiring some experiment or test run to be conducted to verify the theoretical or analytical results coming from the design calculations, before the pandemic happened. As such, topics relevant to only the use of computer (programming/computer modelling) apart from the application of technical knowledge (and avoiding any fabrication or construction related activity) were identified and introduced.

The three topics identified and floated to the students, are titled as follows:

Topic 1-Computer Aided Beam Analysis

Topic 2-Programming the Projectile Motion Calculator

Topic 3-Creative CAD modeling for a social cause

Following the advice from the experts framing the syllabus, one topic (Topic 3) was floated related to problem solution for a social cause. To aid the students in selecting their topic of interest, a separate orientation program was organised through online Google Meet, wherein the topics were discussed in detail and students' queries answered. This report summarizes the contribution of both the regular students and the students who joined their second year late i.e., direct second year admitted students from diploma background (on account of pandemic, and could complete their semester-3 course requirements in the later part of the academic year, along with their regular semester-4 course).

The **problem statements** related to the **three topics** are as follows:

Mahatma Education Society's
Pillai College of Engineering, New Panvel
2020-2021

Second Year - Semester III (Odd) - Mechanical & Automobile Engineering

MINI PROJECT - 1

Computer Aided Beam Analysis

1. Introduction:

A **beam** is a structural member subjected to mostly transverse loads, and withstands by resisting bending. It is important to know the structural integrity of the design of beam-like members (such as shafts, levers, frame components, beam structures, etc.) before construction or fabrication. Beam calculations for various parameters can be cumbersome if done manually, and results from commercial simulation packages (such as ANSYS etc.) are not devoid of truncation and/or round-off errors because they are based on numerical schemes.

To reduce or eliminate these issues, and to instil programming skills ensuring thorough understanding of some topics related to Strength of Materials and Engineering Mathematics subjects, an algorithm based on the analytical equations of simple beams becomes necessary to be implemented in the form of an interactive program, using any software as per the students' choice viz., MS Excel, C++, Java, Python etc.

In general, mechanical components fail either by induced stress exceeding the material limiting stress or by excessive deformation. Hence, it becomes pertinent to calculate the maximum internal forces and moments generated in beams by virtue of external loads and moments, and the corresponding stresses; as well as the slopes and deflections induced. These serve as critical factors in the selection of materials for beams. For the analysis of deflection of beams, there are various methods available, but the Macaulay's method (method of Half-Range or Singularity functions) stands out as one of the best. Unfortunately, developing deflection curves using Macaulay's method can be long, tedious and prone to error if done by manually, and any changes to the original beam loading will require that all calculations be repeated. A general computer program hence becomes necessary to eliminate or limit manual beam deflection computations.

2. Objectives:

A. Develop an **interactive computer program** using **any programming language** of your choice (viz., Excel, C++, Java, Python etc.) to analyze **simple beam structures**.

B. **Validate the results of the program** with manual calculations, or from reference/text book results. Simulation results using any standard application software (such as ANSYS, etc.) may also be appended if required.

C. Once validated, **simulate the results** for different combinations of input parameters.

3. Assumptions:

a. The beam has pure or simple bending, and follows Euler-Bernoulli theory.

b. The beam is prismatic in shape, has a symmetric cross-section, and loading is such that the beam has a linearly elastic behaviour.

c. There are no internal hinges anywhere along the beam length, and the beam is statically determinate.

d. Only a combination of point loads, uniformly distributed loads, uniformly varying loads, and moments are applied as external loads on the beam (either from top or bottom). Parabolic distributed loads are excluded.

e. Inclined point loads and/or loads acting on extended frame extensions at some location of beam length need to be manually simplified and converted to vertical and horizontal load components, with the external moments if any. This is to be done prior to feeding the input data to the program.

4. Input Parameters (standard values to be entered by user):

a. Young's Modulus of Elasticity (E), in MPa

b. Area Moment of Inertia (I) about the axis of bending, in mm^4

c. Type of Beam (Cantilever or Simply Supported)

d. Total Beam Length (L, in metres)

e. Self-weight of the beam, if any (W, in kN)

f. If Simply Supported beam, distance of pin/hinge and roller supports respectively from left end of beam (in metres); and if Cantilever beam, distance in metres, of fixed support from left end of beam (whether at left or right)

g. Number of external transverse point loads (either acting up or down) with their values (in kN) and their corresponding locations from the left end of beam (in metres)

h. Number of external axial point loads (either acting towards left or right) with their values (in kN) and their corresponding locations from the left end of beam (in metres)

i. Number of external moments (either acting clockwise or counter-clockwise) with their values (in kN-m) and their corresponding locations from the left end of beam (in metres)

j. Number of uniformly distributed loads (either acting up or down) with their values (in kN) and their corresponding locations from the left end of beam (location of start and stop of udl, hence defining the range, in metres)

k. Number of uniformly varying loads (either acting up or down) with their max. values (in kN, to be given in either increasing or decreasing fashion from left to right direction) and their corresponding locations from the left end of beam (location of start and stop of uvl, hence defining the range, in metres)

5. Output Parameters (expected results from the execution of the program):

a. Reaction loads and moments (if any) at the supports.

b. Axial Force (AF), Shear Force (SF) and Bending Moment (BM) equations for any cross section along the beam length.

c. Plotting the AF, SF and BM diagrams.

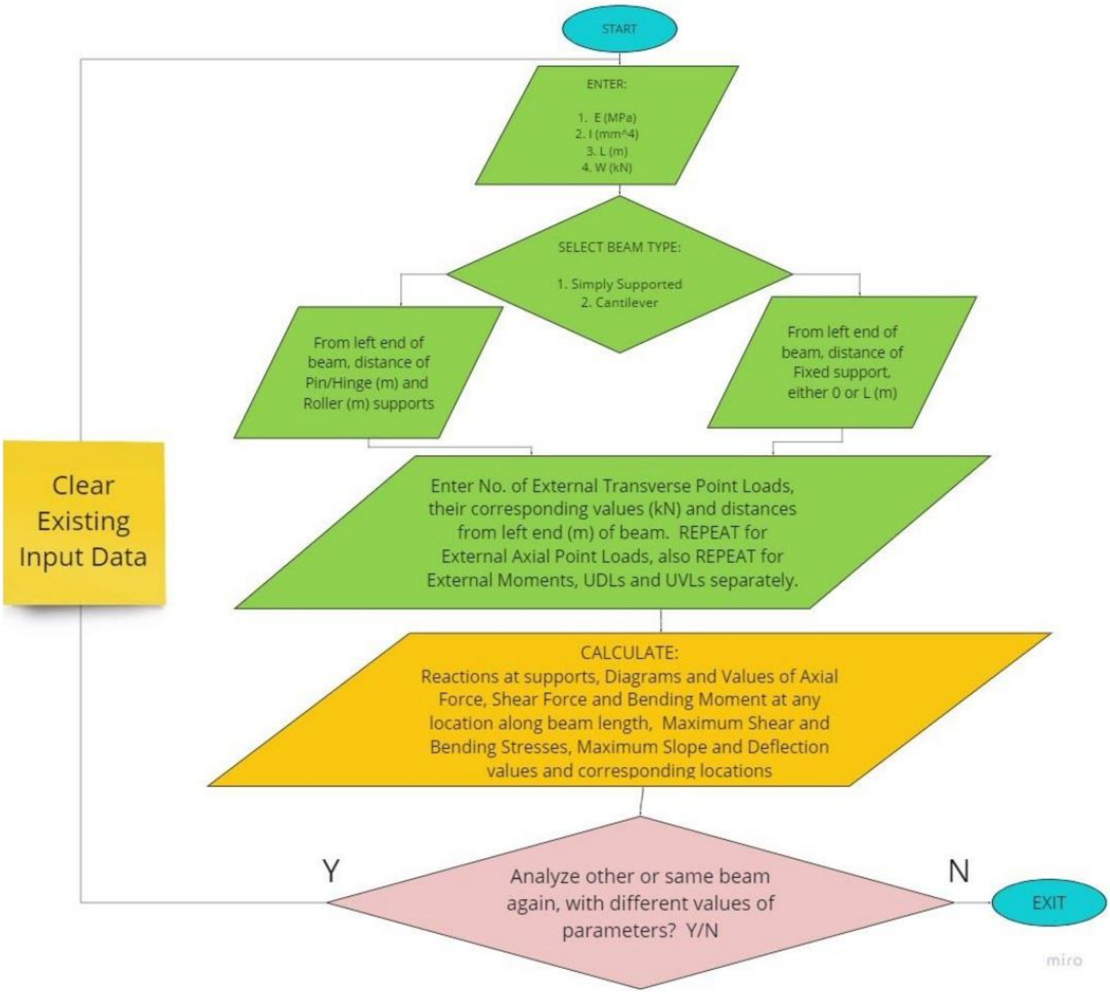
d. Finding the maximum values of AF, SF and BM and their corresponding locations along the beam length.

e. Estimating the maximum shear and bending stresses, and their corresponding locations along the beam length.

f. Deflection and Slope Equations for any cross section along the beam length.

g. Max. Deflection and Max. Slope, and their corresponding locations along the beam length.

Design Flow Chart



6. POINTS TO NOTE:

1. It is expected that a diverse set of programming software is used extensively for the project, by different student groups.

2. If a number of groups happen to use the same software tool for programming, care has to be taken that the programming work should be original and should be done honestly. If a particular group is found to engage in plagiarism of any sort (copy pasting some or all the contents of the program of another group), the project work shall be rejected.

3. There shall be two evaluations: A midterm evaluation (Stage 1, tentatively dated 21 Oct 2020) and a final evaluation (Stage 2, tentatively dated 04 Nov 2020).

4. Stage 1 evaluation shall comprise of creating a program for the plotting of AFD, SFD & BMD, and estimation of bending and shear stresses in the given beam. Stage 2 evaluation shall comprise programming for the estimation of slope and deflection at any point along the beam length.

5. The soft copy of the program created (with comments or necessary instructions, for the user, preferably in the program) in both stages of evaluation, shall be mailed to the Class Coordinator before the assessment by a panel of judges.

6. Also, a detailed and well documented report (preferably typed) in soft copy (pdf format only), and in print (if possible) shall be mailed (to Class Coordinator) and submitted to the panel of judges on or before the assessment dates. The report shall include the objectives of the mini-project, the print-copy of the actual program, brief information to execute the program with necessary nomenclature, the software and version used for programming, sample input data with loading diagram and labeling, manual calculations of the sample input for both the beam types, tabulated comparison of the results for various output parameters between the program and the manual calculation, the contribution of each of the group members in the project, feedback and comments (problems faced, outcomes of the project etc.), and the Conclusions.

________________HAPPY LEARNING____________

Mahatma Education Society's

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Second Year - Semester III (Odd) - Mechanical & Automobile Engineering

MINI PROJECT - 2

Programming the "Projectile Motion Calculator"

Reference: https://amesweb.info/Physics/Projectile-Motion-Calculator.aspx

1. Introduction:

"People with interdisciplinary skills are much more valuable because they're able to understand more complicated systems and the interactions between and among things."---*Jennie Cunningham*, in Quora.com (*"Is-coding-or-programming-necessary-for-a-mechanical-engineering-student?"*).

Keeping this in view, this mini-project is aimed at the use of a programming language (Python) for coding a Physics problem that was studied in the first year of undergraduate engineering course.

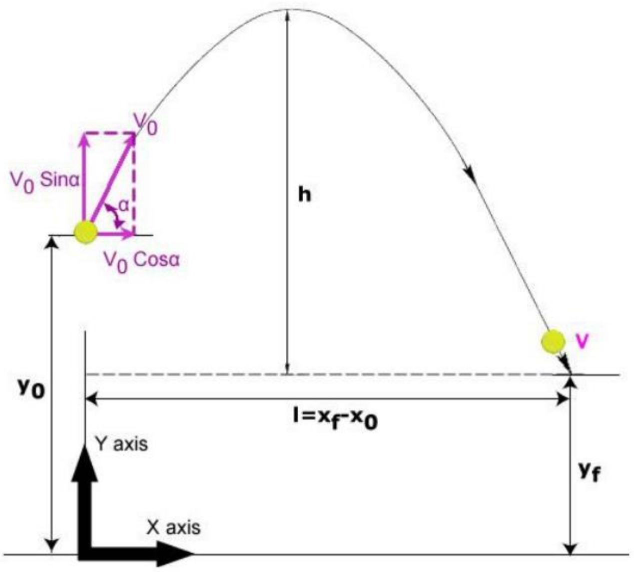
Python is often praised for being a general-purpose language with an easy-to-understand syntax, and has many advantages over other programming languages.

2. Objectives:

A. With **reference** to the website stated above, **write a code** in **Python** that **calculates** various parameters of **Projectile Motion** (given a few quantities of choice as input by the user), and **tabulate the results** thus obtained.

B. Further, the program should be able to **generate plots** between any two parameters of choice as mentioned by the user.

C. Create an **executable file** from the **Python** program, that should run in **Windows** operating system, so that the Python software may not actually be required to be installed in the computer where the application needs to run.



Source: https://amesweb.info/Physics/Projectile-Motion-Calculator.aspx

3. Assumptions:

a. SI base units should be followed for all calculations.

b. The acceleration due to gravity should be assumed to be a constant value of 9.81 m/s^2.

c. The effect of air resistance needs to be ignored in all calculations.

4. Input Parameters (standard values to be entered by user):

a. **Initial Height (y_0)** and **Final Height (y_f)** values should be entered by the user as known input data, for all calculations.

b. Of the other parameters viz., **Initial Velocity (V_0), Launch Angle (α), Horizontal Distance (l), Maximum Height (h) and Flight Duration (t);** any **two** values (as per the user's choice) also should be entered as known input data, in addition to the initial and final height values.

5. Output Parameters (expected results from the execution of the program):

a. All the remaining parameters and other parameters (as specified in the Reference) should be calculated by the program.

6. POINTS TO NOTE:

a. It is expected that each student group writes its own code.

b. Care has to be taken that the programming work should be original and should be done honestly. If a particular group is found to engage in plagiarism of any sort (copy pasting some or all the contents of the program of another group), the project work shall be rejected.

c. There shall be two evaluations: A midterm evaluation **(Stage 1, tentatively dated 21 Oct 2020)** and a final evaluation **(Stage 2, tentatively dated 04 Nov 2020)**.

d. The soft copy of the program created (with comments or necessary instructions, for the user, preferably in the program) in both stages of evaluation, shall be mailed to the Class Coordinator before the assessment by a panel of judges.

e. Also, a detailed and well documented report (preferably typed) in soft copy (pdf format only), and in print (if possible) shall be mailed (to Class Coordinator) and submitted to the panel of judges on or before the assessment dates. The report shall include the objectives of the mini-project, the print-copy of the actual program, brief information to execute the program with necessary nomenclature, sample input data, manual calculations of the sample input, the contribution of each of the group members in the project, feedback and comments (problems faced, outcomes of the project etc.), and the Conclusions.

__________________HAPPY LEARNING_____________

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Pillai College of Engineering, New Panvel

2020-2021

Second Year - Semester III (Odd) - Mechanical & Automobile Engineering

MINI PROJECT - 3

Creative CAD Modeling for a Social Cause

References:

1. https://www.careerbuilder.com/advice/be-creative-and-innovative-as-a-mechanical-engineer
2. https://www.eatthis.com/face-masks-side-effects/
3. https://grabcad.com/library/glasses-and-mask-1
4. https://3dprint.nih.gov/discover/3dpx-014004

1. Introduction:

Mechanical (also the closely related **Automobile**!) **engineering** is a great career option for people who love challenging the status quo and looking for ways to constantly improve the existing infrastructure. It involves a great deal of planning, but there's also the creative aspect that lets professionals tinker and build something out of nothing. This is why many mechanical and automobile engineers love their jobs -- the invention and creative processes.

So, get ready! Ignite your minds so that you can end up being a successful entrepreneur and can create your own start-up, not long after you complete your course! Or, who knows? You might be one of those people successfully creating valuable and cost-effective products and solutions in the "Make-In-India" scheme in the near future, or might end up winning prizes and accolades from the University or Inter-University (Avishkar Competition) or, from the Government for your services in the social scene. The opportunities are many!

Use your left and right brain skills to brainstorm solutions and work out the technical elements for a launch. You are encouraged to use free, open source CAD 3D parametric modeling software tools viz., **FreeCAD** (or similar) to model designs for **Face Mask-cum-Glasses** as a form of **Safety & Personal Protection Equipment (PPE)** to tackle the Covid-19 virus in the current pandemic. **So, grab the opportunity to work in teams, and leverage your creative ability to benefit communities on a social cause!** Best designs get a chance to create a scaled

Rapid Prototype (RP) model in the college (**Maker's Studio**) free of charge, noting that once created, they shall remain the sole properties of the Institution. You may add your names and group number in the model by providing engraved letters at suitable locations in the .stl format of the model.

2. **Skill sets that form the outcomes once the project work is successfully completed include**--creativity, critical thinking, data analysis, communication, financial analysis/costing and budgeting, material selection, CAD modeling, team building, report writing, ability to work under pressure in tight deadlines and schedule (time management), attention to detail etc.

A sample unit of the Face Mask-cum-Glasses is shown in images of Fig. 1 below, for reference. Fig. 2 shows images of only the Face Mask without glasses.

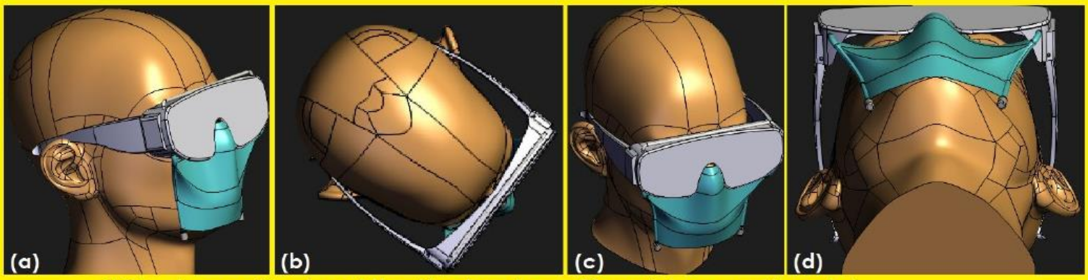


FIG.1. Images Courtesy: https://grabcad.com/library/glasses-and-mask-1

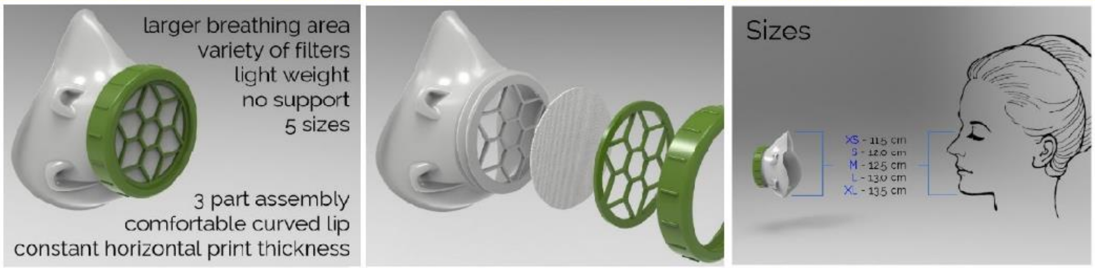


FIG. 2. Images Courtesy: NIH 3D Print Exchange, https://3dprint.nih.gov/discover/3dpx-014004

3. **Important Considerations that may be addressed while designing/modeling the Face Mask-cum-Glasses device:** ***(please go through the literature concerning each of the following, from the internet sources before embarking on the design solutions)***
   a. Design and manufacturing perspectives.
   b. Whether the device can be used in conjunction with bike-helmet?
   c. Testing to assess the out-gasing limits of the material or their corresponding health effects--may be explored as a future scope of study.

d. How much light weight can the device be made?
e. Can the device be made of materials from everyday use, cheap and available, easily manufacturable?
f. Is there an ability to reuse the device by sanitizing it after every use, whether any sanitizer can be mounted on it, if any?
g. Can children also use it (scalability within the same device possible?)
h. Long-beards issue for some men.
i. Blurry vision due to scratches over the glasses. How to avoid foggy glasses when wearing a face mask?
j. Issue of getting hot in the mask. Breathing issue. Whether ventilation concerns are addressed?
k. Ease of speaking to avoid muffle sound (forget the ability to read lips and see facial expressions!).
l. How to address the issue of a person already wearing spectacles? Can our eyes be totally isolated from the incoming virus if any?
m. Is it possible to wear the face mask while exercising?
n. Whether multiple layers of fabric for the face mask can be incorporated on an adjustable basis?
o. As per the contents mentioned in the image of Fig.2, this is not really suitable for SLS, SLA or injection molding due to varying wall thickness (0.85-1.2 mm). So, whether your device has varying or uniform wall thickness?
p. Whether the device is able to be laundered and machine dried without damage or change to shape.
q. Whether Face-mask skin problems may occur? Further, will there be a difficulty in breathing--particularly for people with COPD (chronic obstructive pulmonary disease)?
r. Whether the top of your mask is tight and the bottom looser (to help direct your exhaled breath away from your eyes)?
s. Whether the mask messes with your sight physically? Also, whether the exhaled air gets into your eyes? (If so, this generates an uncomfortable feeling and an impulse to touch your eyes. This is risky, since hands may be contaminated and thus you are infecting yourself).
t. Whether the Right Cloth for the Mask has been used?
u. Is the face mask-cum-glasses unit comfortable to wear for people--particularly who wear hearing aids or cochlear implants?
v. Whether Pliable Nose Wires are used? (Preferred nose wire is one that is soft enough to bend on your face for a custom fit, and strong enough to hold that shape.)
w. Whether additional accessories viz., Strip Inserts, Nose Guards, Adjustable Ear-Loops for the most secure fit possible, are used?
x. Etcetera...

6. POINTS TO NOTE:

a. Include all your solutions in the form of design models--rough pencil sketches or computer models (from the crudest to the most refined, in your report, and discuss why you intended to make changes in each of the revised solutions).

b. Care has to be taken that the design model solutions should be unique. If a particular group is found to engage in plagiarism of any sort (copy pasting some or all the contents of the program of another group), the project work shall be rejected.

c. **You are advised to download a generic 3D model of a human head (male/female) in .iges/.stl format, many of which are available for free from the internet sources. This can be used as a dummy person on the basis of which the PPE can be designed.**

d. There shall be **two evaluations**: A midterm evaluation **(Stage 1, tentatively dated 21 Oct 2020)** and a final evaluation **(Stage 2, tentatively dated 04 Nov 2020)**.

e. The soft copy of the CAD files (of all the solutions) in both stages of evaluation, shall be mailed to the Class Coordinator before the assessment by a panel of judges.

f. Also, a **detailed and well documented report** (preferably typed) in soft copy (pdf format only), and in print (if possible) shall be mailed (to Class Coordinator) and submitted to the panel of judges on or before the assessment dates. **The report shall include**--the objectives of the mini-project, the print-copy of the CAD models (for all solutions), brief discussion on each model highlighting the pros and cons and why revision was considered necessary, the contribution of each of the group members in the project, feedback and comments (problems faced, outcomes of the project etc.), and the Conclusions.

_______________HAPPY LEARNING___________

The **number of student groups** in the respective classes and the **extent to which the topics were selected by each class**, is tabulated as follows:

CLASS	*No. of Groups selecting TOPIC 1*	*No. of Groups selecting TOPIC 2*	*No. of Groups selecting TOPIC 3*	*TOTAL No. of Groups in the Class*
SE MECH-A	0	5	14	**19**
SE MECH-B	1	6	15	**22**
SE AUTO	2	3	15	**20**

To monitor the performance of the student groups, there were 2 in-semester evaluations conducted by the faculty members of the departments. Separate rubrics were framed for each topic. Similar rubrics were followed for both the topics 1 and 2 since they relate to programming aspects, with slight exceptions. The **rubrics** framed for all the three topics are highlighted as follows:

EVALUATION RUBRICS FOR TOPIC-1 & TOPIC-2:

Parameter	**Excellent (100%)**	**Good (75%)**	**Fair (50%)**	**Poor (0-25%)**	**SCORE (out of 10 m each)**
Design of Output Content related to the Beam Analysis or Projectile Motion (the extent to which technical information related to beam analysis or projectile motion is simulated by the program) **10 marks**	Program displays ALL the output parameters (10)	Program displays most (about 5 in number) if not all, of the output parameters (7.5)	Program displays less (about 2-3 in number) of calculated output parameters (5)	Program doesn't display or display a max.of only 1 output parameter (0 - 2.5)	
Correct Output (the extent to which the executed output tallies with the manual calculations) **10 marks** **Note:** Keep at least 1 sample manual calculation ready.	Complete tally of program output with manual calculations (10)	Reasonable tally of program output, with minimal error involved (7.5)	Some discrepancies in the output results observed (5)	Program does not execute at all, or there is appreciable error involved (0-2.5)	
Run-time Errors involved during execution of the program **10 marks**	No run-time errors or warnings involved. (10)	Reasonably good execution, with warnings only, no run-time errors (7.5)	Minimal errors, but program executes, and there's some output (5)	Program has lots of unresolved run-time errors, doesn't execute at all (0 - 2.5),	
Program Documentation (involves comments at suitable locations for proper understanding, in the code) **10 marks**	Extensive comments added for the new user to understand the code completely (10)	Fair amount of comments added for the new user to understand the code (7.5)	Very few comments added to the code for proper understanding of the code (5)	No or minimal comments added in the program code (0 - 2.5)	
Report Documentation (soft copy consisting of the program code, input values, program output, verification of output values with data from manual calculations etc.) **10 marks**	Complete documentation provided (10)	Almost complete documentation provided (7.5)	Less documentation provided (5)	Very less or zero documentation (0 - 2.5)	
TOTAL SCORE (OUT OF 50 marks)					

EVALUATION RUBRICS FOR TOPIC-2:

Parameter	Excellent (100%)	Good (75%)	Fair (50%)	Poor (0-25%)	SCORE (out of 10 m each)
Quality of Design / Creativity / Aesthetics / Uniqueness of Design 10 marks	(10)	(7.5)	(5)	(0 - 2.5)	
Quality of 3D CAD Drawings and Renderings 10 marks	(10)	(7.5)	(5)	(0 - 2.5)	
Design for Ease of Manufacturability & Assembly 10 marks	(10)	(7.5)	(5)	(0 - 2.5)	
Functionality & Safety Aspects 10 marks	(10)	(7.5)	(5)	(0 - 2.5)	
Documentation (Involves Rough Sketches or Designs, Discussion on Pros and Cons of various designs, Selection of Final Design, images from various view angles of the final design of Face Mask-cum-Glasses, etc. as laid down in the Problem Statement) 10 marks	Complete documentation provided (10)	Almost complete documentation provided (7.5)	Less documentation provided (5)	Very less or zero documentation (0 - 2.5)	
TOTAL SCORE (OUT OF 50 marks)					

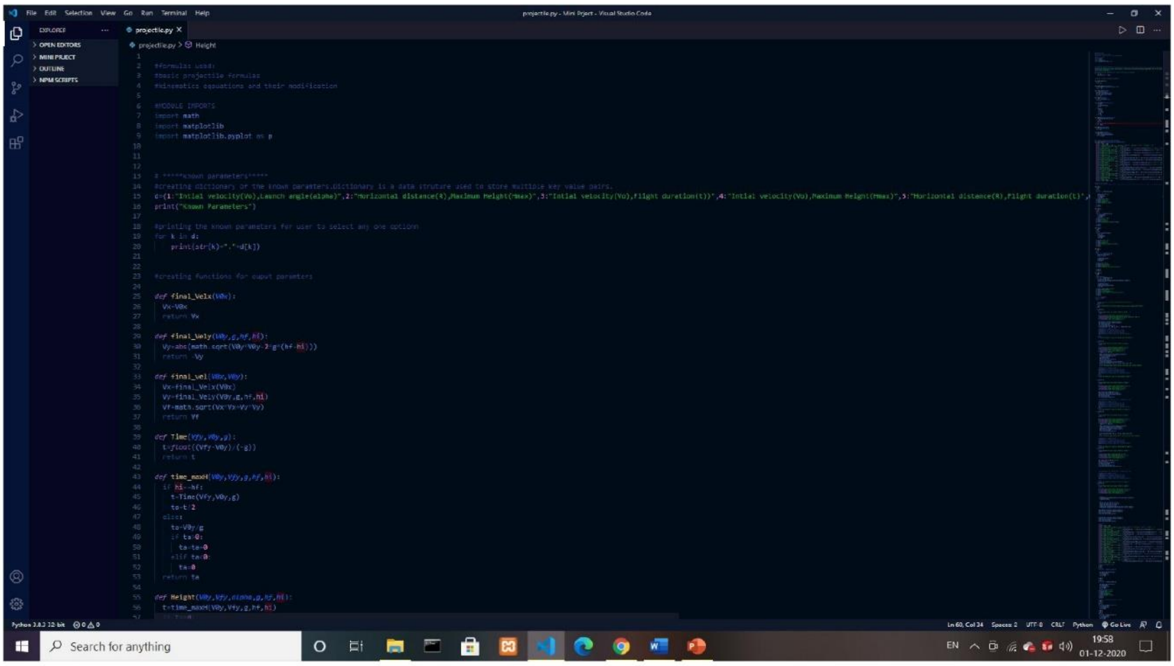
The students later had to appear for the viva-voce in the presence of Internal and External Examiners, as per the rules laid down by the Mumbai University.

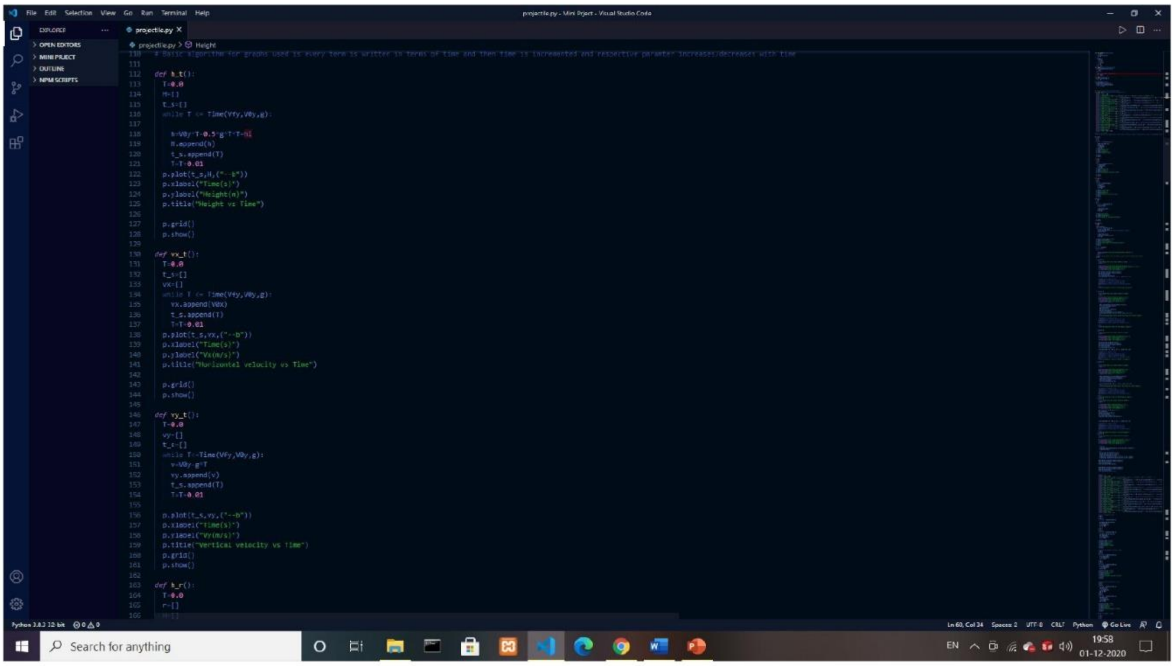
It was observed that very few number of groups had opted for the Topic 1 i.e., Computer Aided Beam Analysis, a topic related to the subject of Strength of Materials, presumably due to the massive efforts required in terms of theoretical understanding, and also in the programming sense. Maximum number of groups selected Topic 3 for their work, and a decent few number of groups selected the Topic 2.

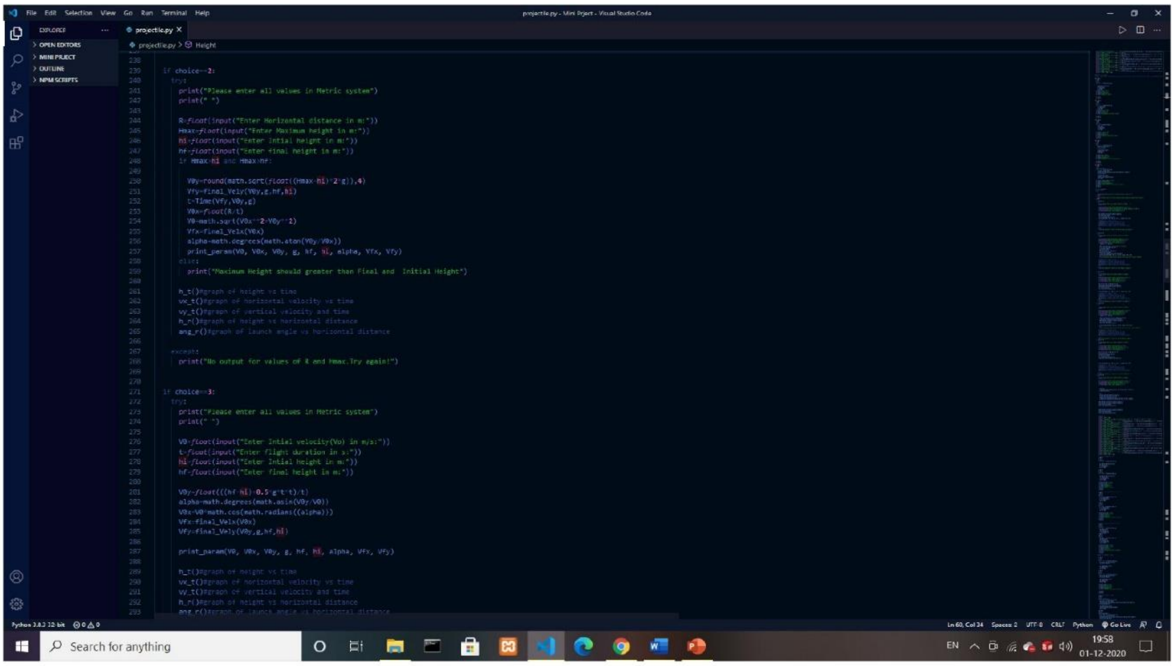
Students also submitted the source files of their project, along with a detailed report, and a Powerpoint presentation file, as a part of their term work. To conclude, in spite of the difficulties posed by the pandemic and work cornered through homes, students managed to work on their mini-project topic and got to learn the technical knowledge related to the subject/s, team building and management, effective communication, presentation (written and verbal), report writing, scheduling, delegation, costing etc.

Sample work and a few snapshots of Mini-Project-1A taken during the evaluation stages or from the student reports, are provided for reference, as follows.

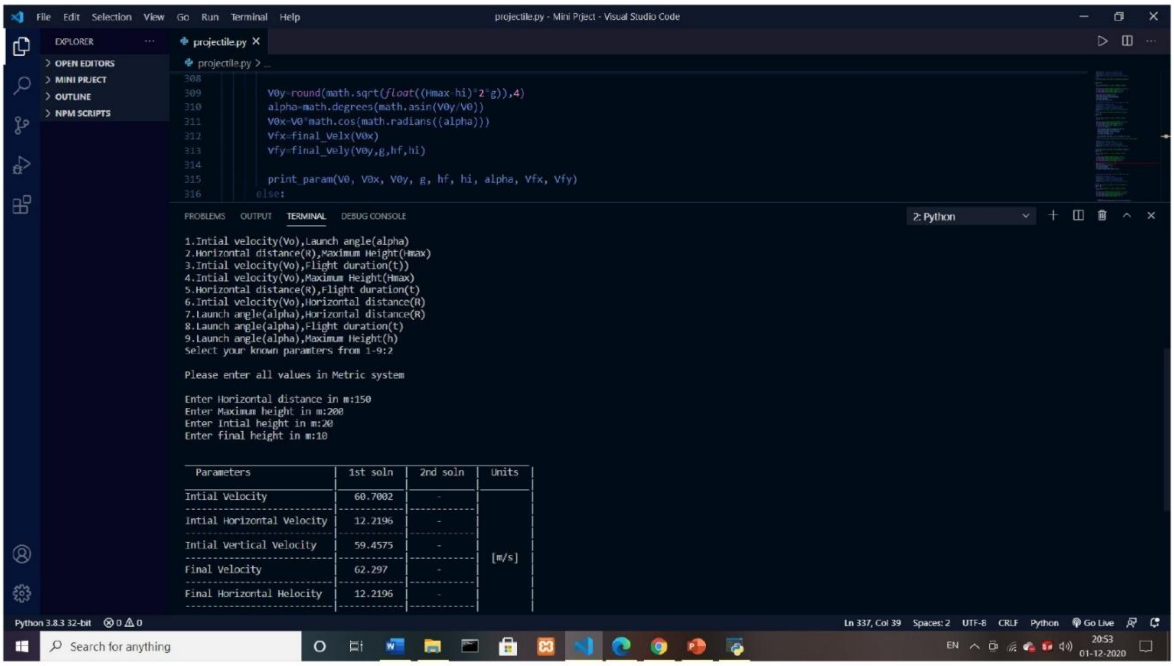
Sample Student-group Work (**Topic 2**: Programming the Projectile Motion Calculator, in Python software) – by Dattaram Malkar & group, SE Mech-A:



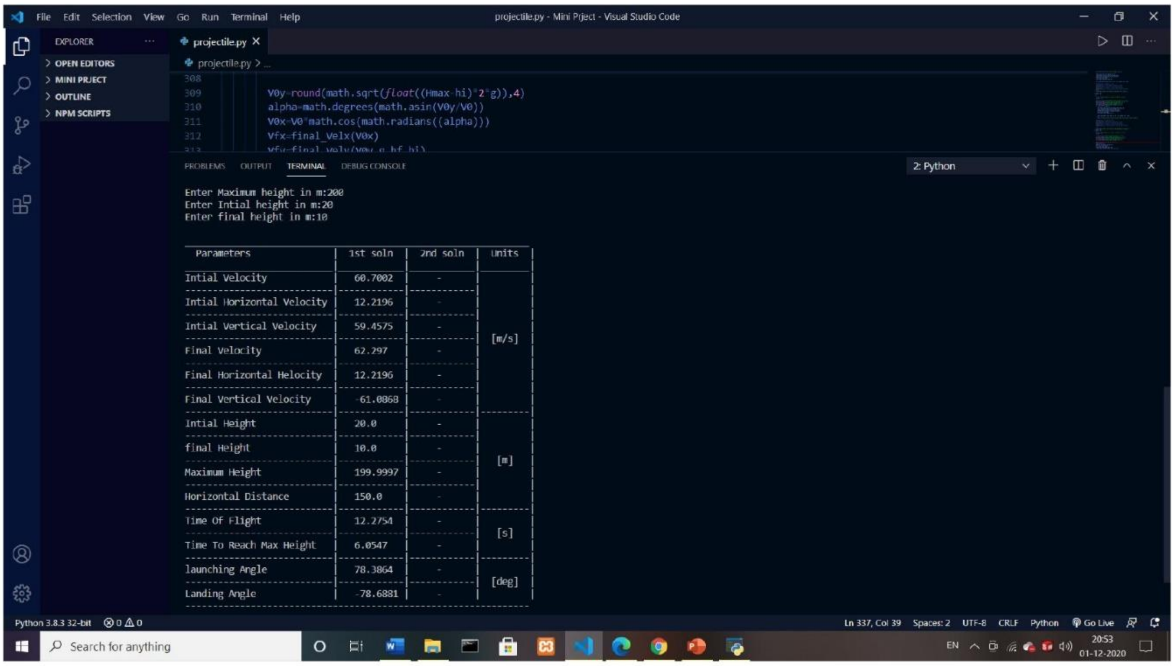


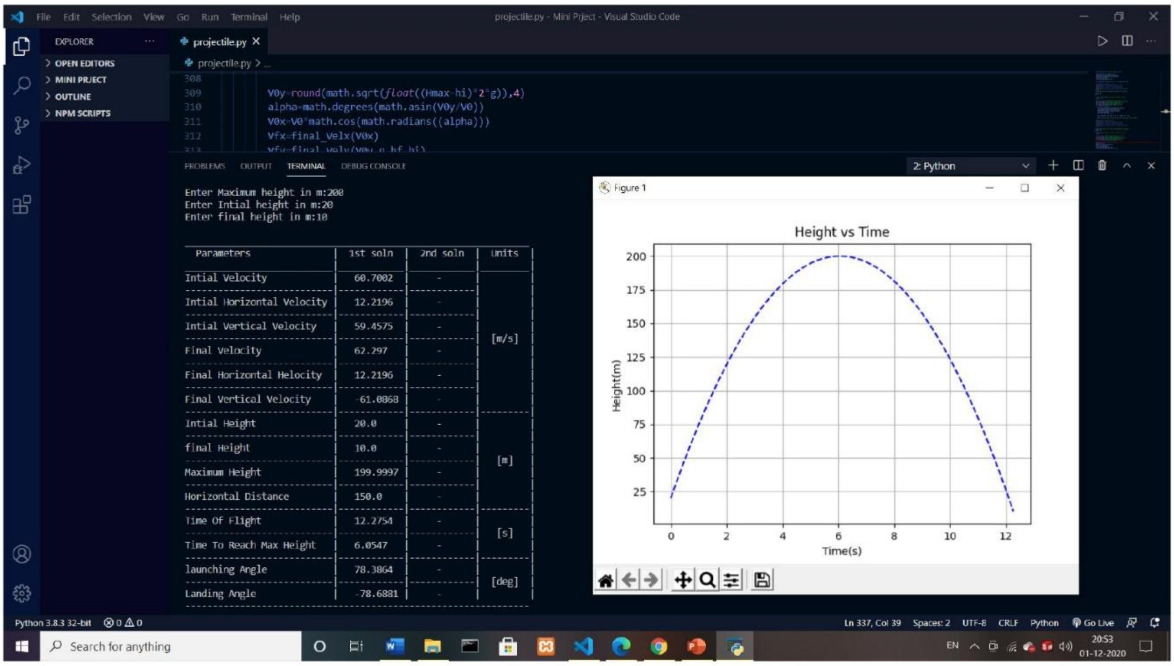


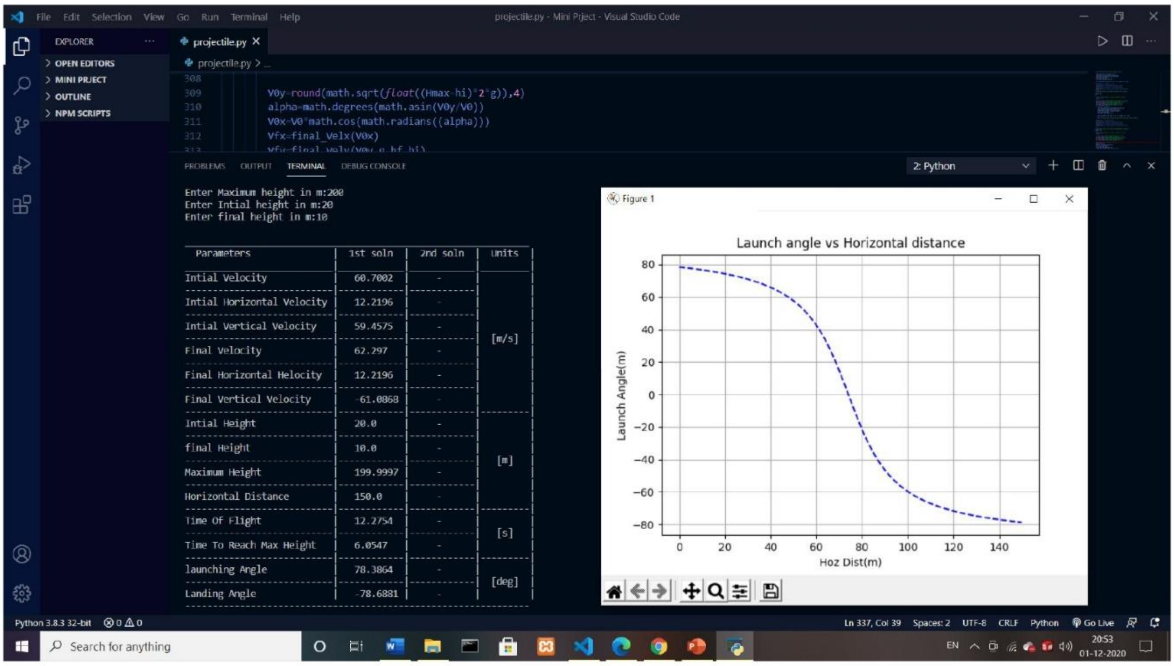
projectile.py - Mini Prject - Visual Studio Code
projectile.py
if choice==2:
try:
print("Please enter all values in Metric system")
print(" ")
R=float(input("Enter Horizontal distance in m:"))
Hmax=float(input("Enter Maximum height in m:"))
hi=float(input("Enter Intial height in m:"))
hf=float(input("Enter final height in m:"))
V0y=round(math.sqrt(float((Hmax-hi)*2*g)),4)
Vfy=final_Vely(V0y,g,hf,hi)
t=Time(Vfy,V0y,g)
V0x=float(R/t)
Vfx=final_Velx(V0x)
alpha=math.degrees(math.atan(V0y/V0x))
print_param(V0, V0x, V0y, g, hf, hi, alpha, Vfx, Vfy)
else:
print("Maximum Height should greater than Final and Initial Height")
except:
print("No output for values of R and Hmax.Try again!")
if choice==3:
try:
print("Please enter all values in Metric system")
print(" ")
V0=float(input("Enter Intial velocity(Vo) in m/s:"))
t=float(input("Enter flight duration in s:"))
hi=float(input("Enter Intial height in m:"))
hf=float(input("Enter final height in m:"))
alpha=math.degrees(math.asin(V0y/V0))
V0x=V0*math.cos(math.radians((alpha)))
Vfx=final_Velx(V0x)
Vfy=final_Vely(V0y,g,hf,hi)
print_param(V0, V0x, V0y, g, hf, hi, alpha, Vfx, Vfy)
Search for anything



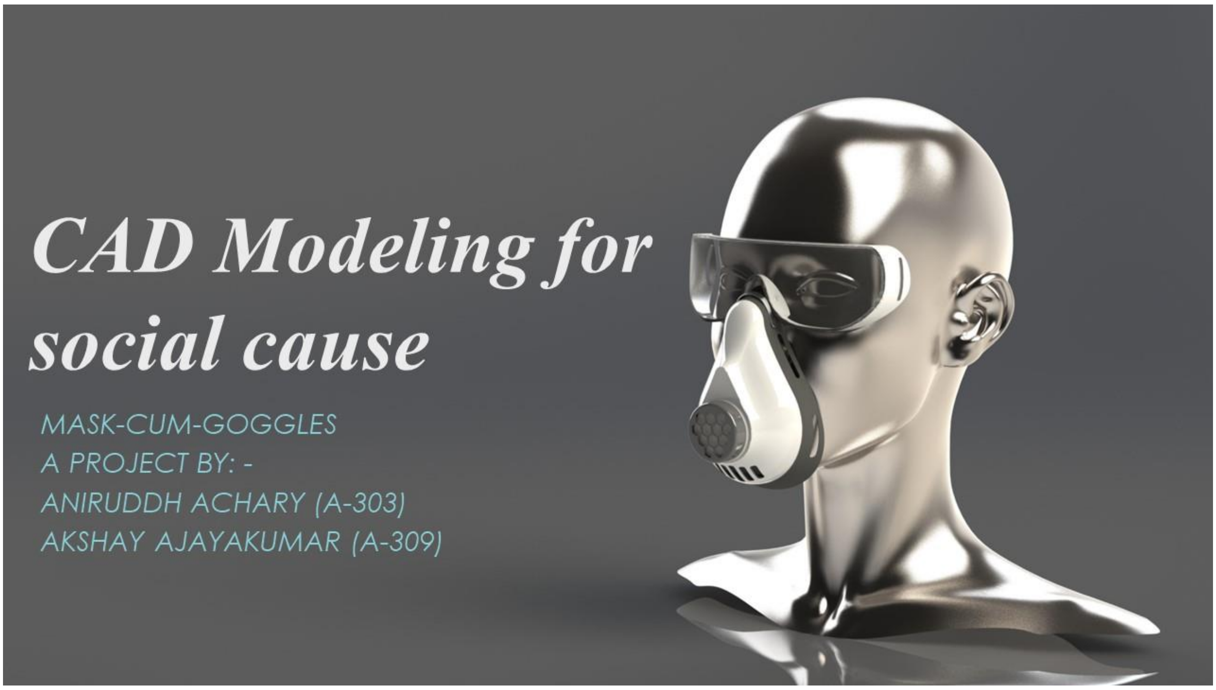
projectile.py - Mini Prject - Visual Studio Code
projectile.py
V0y=round(math.sqrt(float((Hmax-hi)*2*g)),4)
alpha=math.degrees(math.asin(V0y/V0))
V0x=V0*math.cos(math.radians((alpha)))
Vfx=final_Velx(V0x)
Vfy=final_Vely(V0y,g,hf,hi)
print_param(V0, V0x, V0y, g, hf, hi, alpha, Vfx, Vfy)
else:
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE
1.Intial velocity(Vo),Launch angle(alpha)
2.Horizontal distance(R),Maximum Height(Hmax)
3.Intial velocity(Vo),Flight duration(t))
4.Intial velocity(Vo),Maximum Height(Hmax)
5.Horizontal distance(R),Flight duration(t)
6.Intial velocity(Vo),Horizontal distance(R)
7.Launch angle(alpha),Horizontal distance(R)
8.Launch angle(alpha),Flight duration(t)
9.Launch angle(alpha),Maximum Height(h)
Select your known paramters from 1-9:2
Please enter all values in Metric system
Enter Horizontal distance in m:150
Enter Maximum height in m:200
Enter Intial height in m:20
Enter final height in m:10
Parameters | 1st soln | 2nd soln | Units
Intial Velocity | 60.7002 | -
Intial Horizontal Velocity | 12.2196 | -
Intial Vertical Velocity | 59.4575 | - | [m/s]
Final Velocity | 62.297 | -
Final Horizontal Helocity | 12.2196 | -
Search for anything


projectile.py - Mini Prject - Visual Studio Code
V0y=round(math.sqrt(float((Hmax-hi)*2*g)),4)
alpha=math.degrees(math.asin(V0y/V0))
V0x=V0*math.cos(math.radians((alpha)))
Vfx=final_Velx(V0x)
Enter Maximum height in m:200
Enter Intial height in m:20
Enter final height in m:10
Parameters | 1st soln | 2nd soln | Units
Intial Velocity | 60.7002 | - |
Intial Horizontal Velocity | 12.2196 | - |
Intial Vertical Velocity | 59.4575 | - | [m/s]
Final Velocity | 62.297 | - |
Final Horizontal Helocity | 12.2196 | - |
Final Vertical Velocity | -61.0868 | - |
Intial Height | 20.0 | - |
final Height | 10.0 | - | [m]
Maximum Height | 199.9997 | - |
Horizontal Distance | 150.0 | - |
Time Of Flight | 12.2754 | - | [s]
Time To Reach Max Height | 6.0547 | - |
launching Angle | 78.3864 | - | [deg]
Landing Angle | -78.6881 | - |
Python 3.8.3 32-bit
Ln 337, Col 39 Spaces: 2 UTF-8 CRLF Python Go Live
Search for anything
20:53
01-12-2020


projectile.py - Mini Prject - Visual Studio Code
V0y=round(math.sqrt(float((Hmax-hi)*2*g)),4)
alpha=math.degrees(math.asin(V0y/V0))
V0x=V0*math.cos(math.radians((alpha)))
Vfx=final_Velx(V0x)
Enter Maximum height in m:200
Enter Intial height in m:20
Enter final height in m:10
Parameters | 1st soln | 2nd soln | Units
Intial Velocity | 60.7002 | - |
Intial Horizontal Velocity | 12.2196 | - |
Intial Vertical Velocity | 59.4575 | - | [m/s]
Final Velocity | 62.297 | - |
Final Horizontal Helocity | 12.2196 | - |
Final Vertical Velocity | -61.0868 | - |
Intial Height | 20.0 | - |
final Height | 10.0 | - | [m]
Maximum Height | 199.9997 | - |
Horizontal Distance | 150.0 | - |
Time Of Flight | 12.2754 | - | [s]
Time To Reach Max Height | 6.0547 | - |
launching Angle | 78.3864 | - | [deg]
Landing Angle | -78.6881 | - |
Figure 1
Height vs Time
Height(m)
Time(s)
Python 3.8.3 32-bit
Ln 337, Col 39 Spaces: 2 UTF-8 CRLF Python Go Live
Search for anything
20:53
01-12-2020

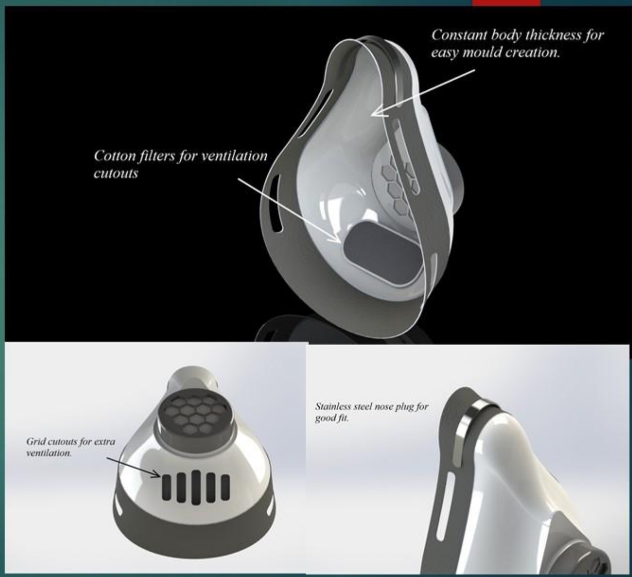


Sample Student-group Work (**Topic 3:** CAD Modeling for a Social Cause) – by Aniruddh Achary and group, SE Mech-A:



Advantages

- The main advantage of this mask is that it is highly reusable because the replaceable mask filters.
- It can be easily cleaned because of the limited number of corners and edges.
- It is very well suited for people suffering from COPD because of the extra grid cut outs given, limiting the obstruction to breathing freely.
- The included nose plug provides a better fit



Goggles

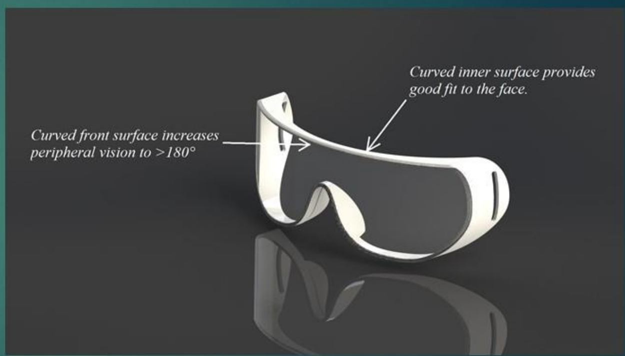
- Stage 2: - (Passed)

This draft of the goggles has a curved front surface which increases the peripheral vision to greater than 180°.

The grid cut outs provided on the side makes it compatible with the adjustable head strap.

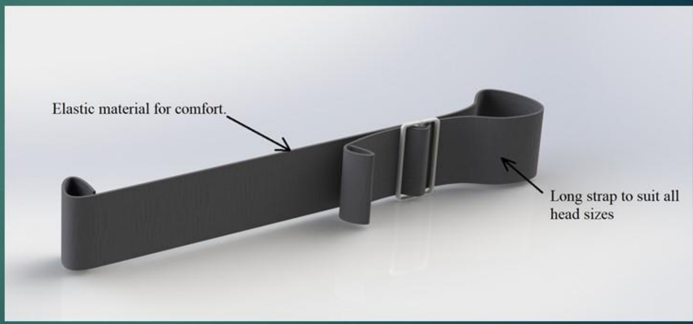
Space has been provided on the sides to include the temples if the wearer needs to wear spectacles along with it.

The front material is clear anti fog hard plastic and not glass which increases the durability of the goggles.



Adjustable head strap

- The main purpose of creating an adjustable head strap is to make the mask and the goggles usable for all and to limit the size difference factor.



Adjustable head strap

- The material of the strap is elastic and has an adjustment mechanism com monly found on bag straps and swimming goggle straps.

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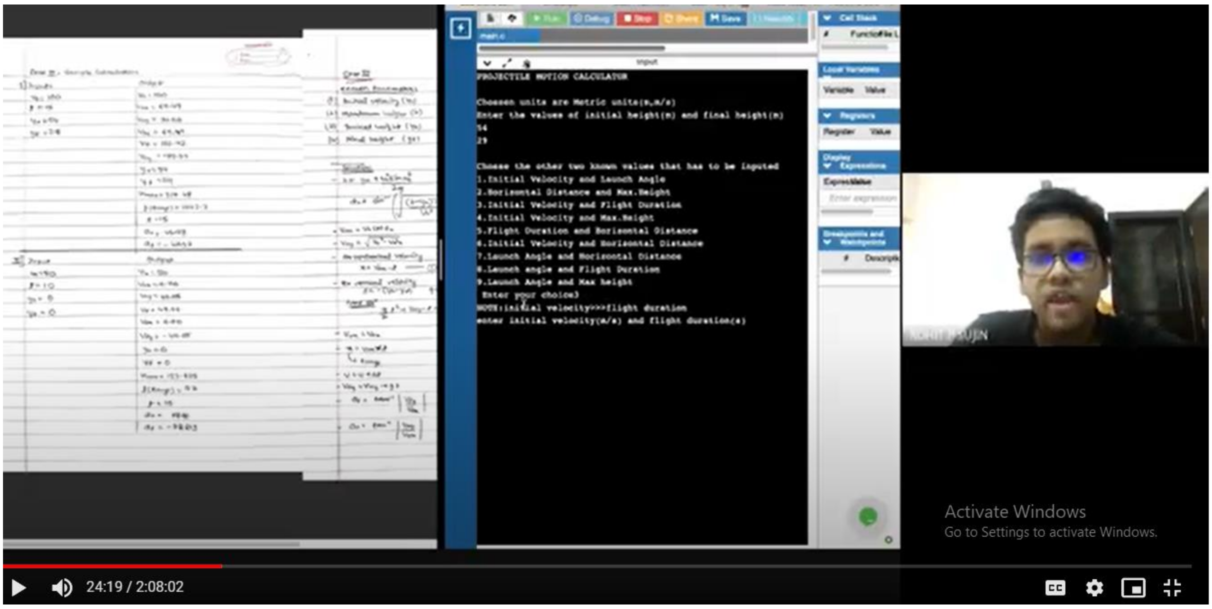
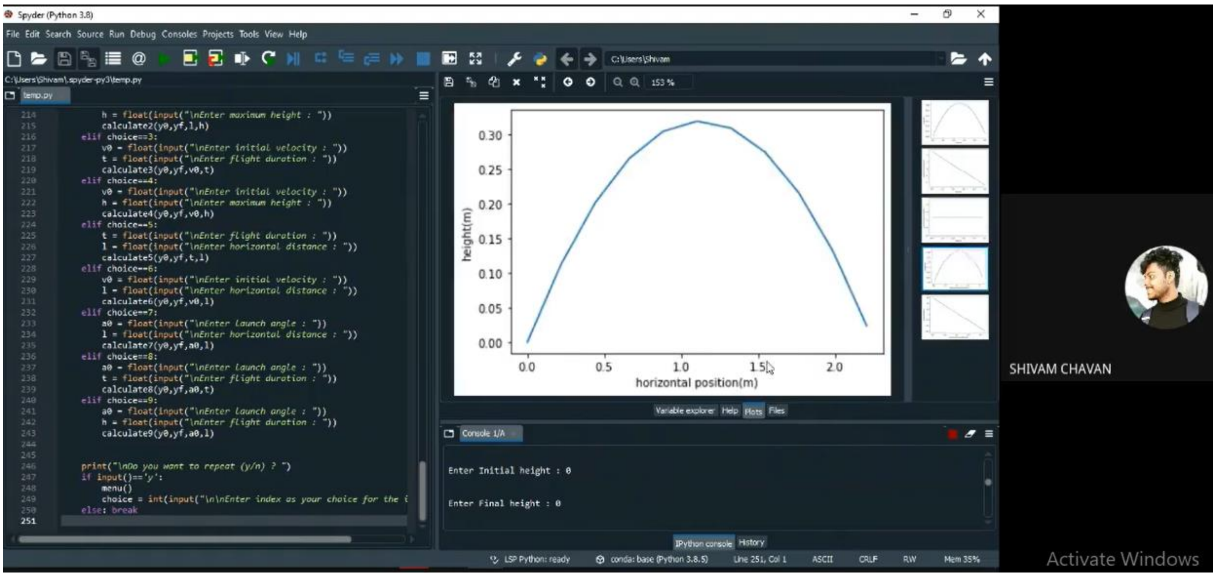
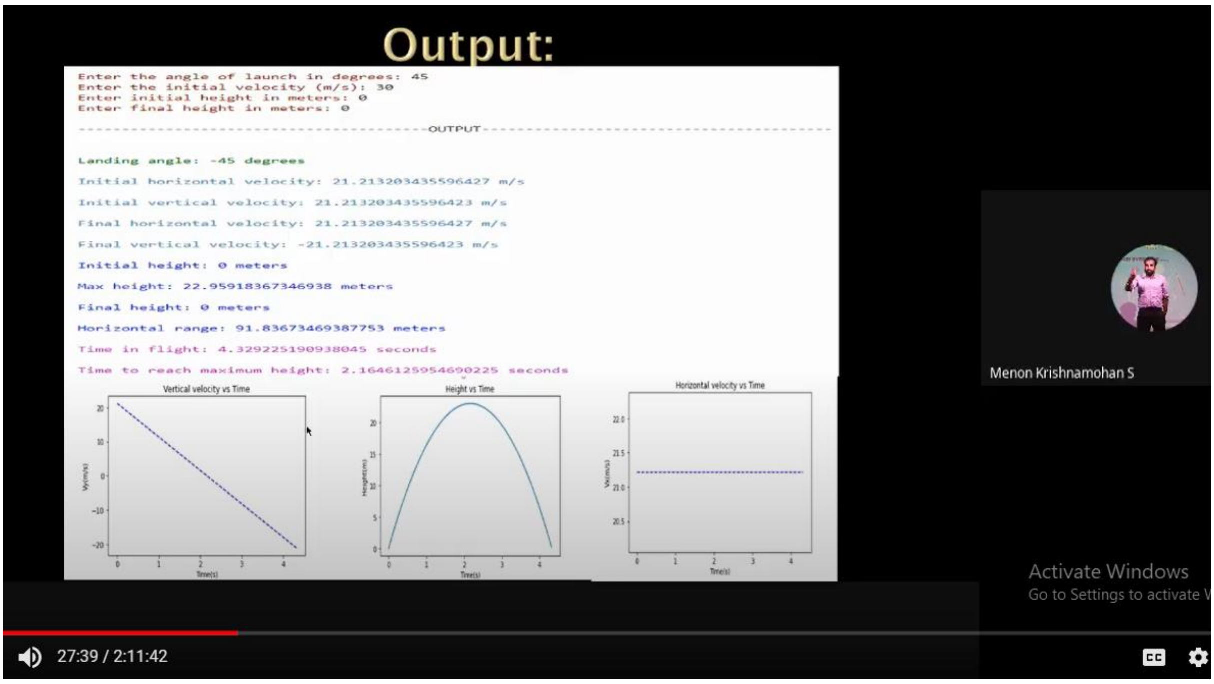
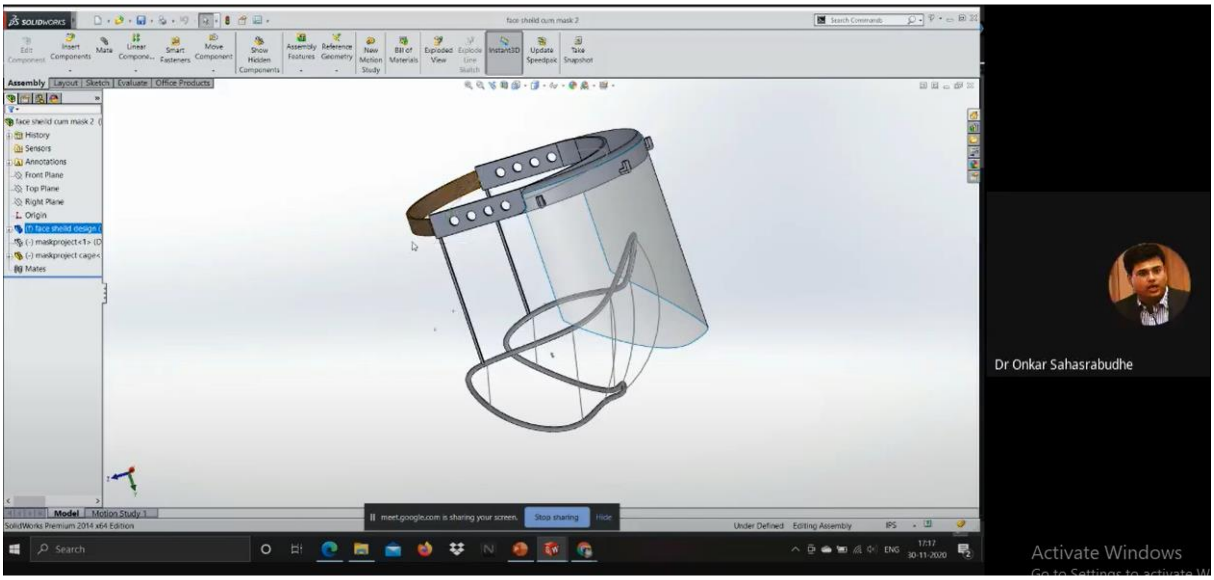
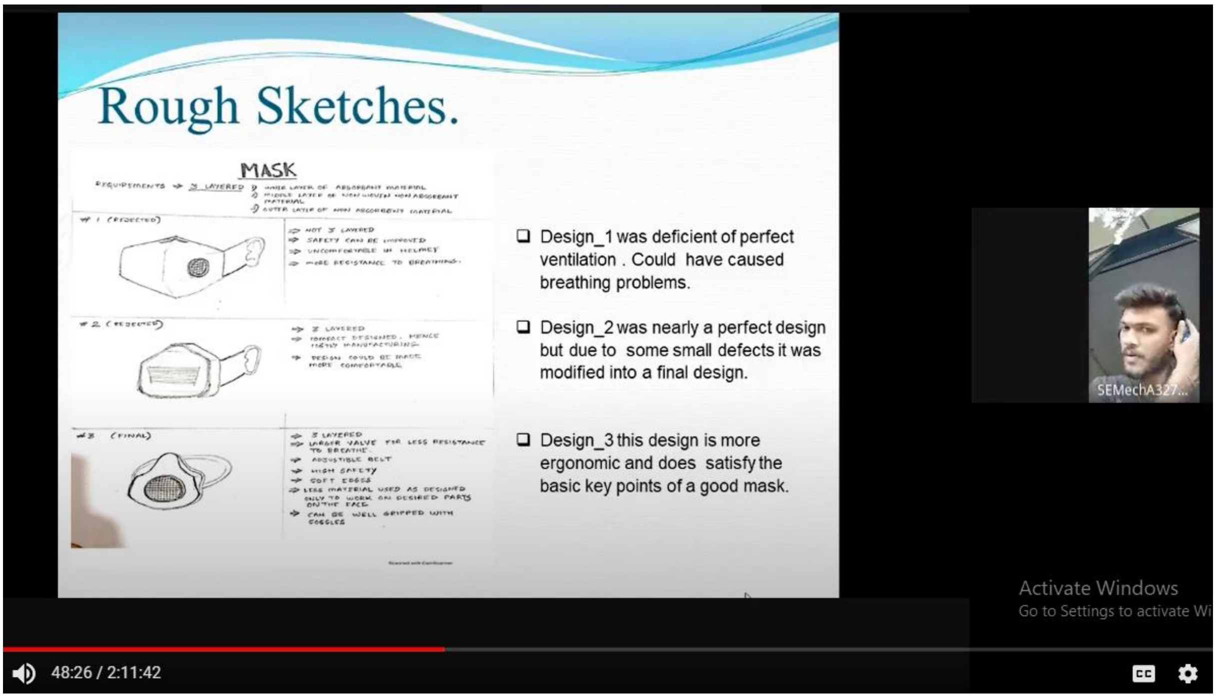
Few Snapshots from the Online Evaluations:

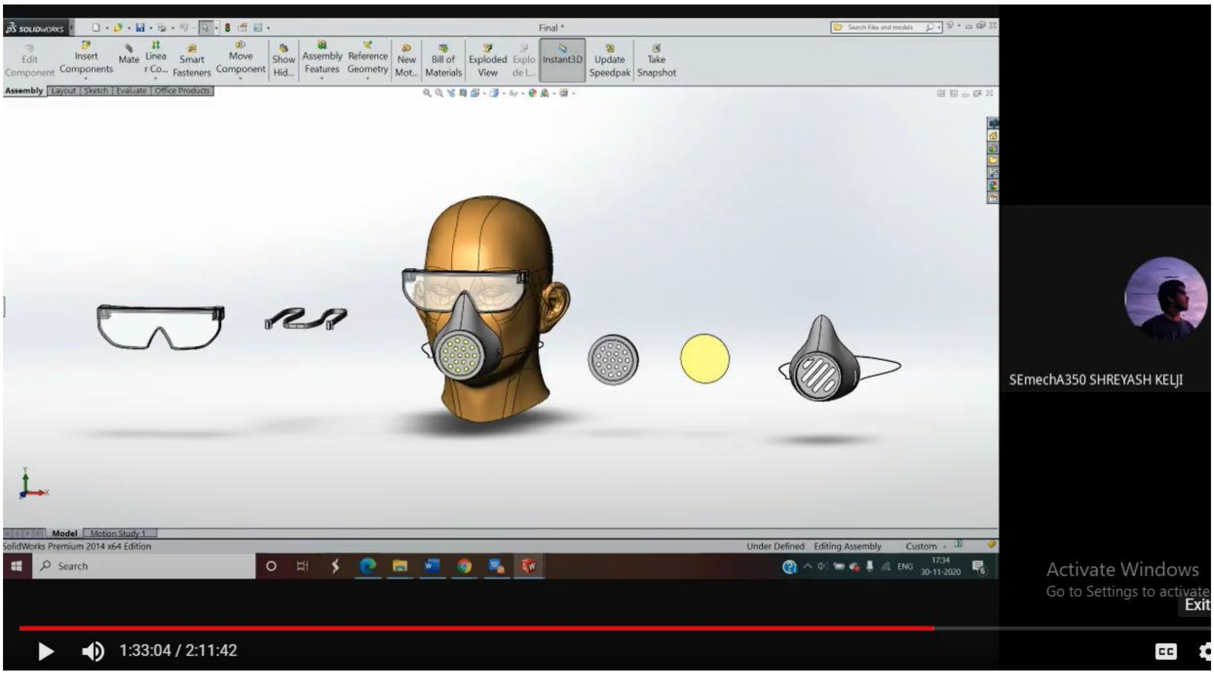




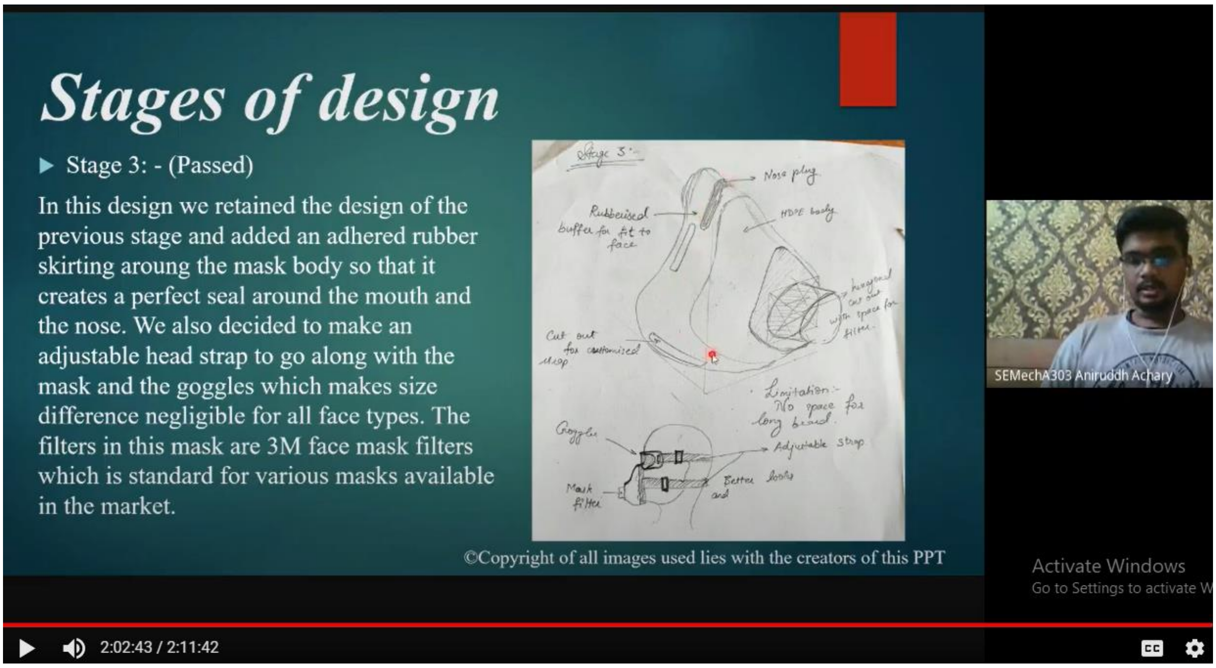

Output:
Enter the angle of launch in degrees: 45
Enter the initial velocity (m/s): 30
Enter initial height in meters: 0
Enter final height in meters: 0
OUTPUT
Landing angle: -45 degrees
Initial horizontal velocity: 21.213203435596427 m/s
Initial vertical velocity: 21.213203435596423 m/s
Final horizontal velocity: 21.213203435596427 m/s
Final vertical velocity: -21.213203435596423 m/s
Initial height: 0 meters
Max height: 22.95918367346938 meters
Final height: 0 meters
Horizontal range: 91.83673469387753 meters
Time in flight: 4.329225190938045 seconds
Time to reach maximum height: 2.1646125954690225 seconds
Vertical velocity vs Time
Height vs Time
Horizontal velocity vs Time
Menon Krishnamohan S
Activate Windows
Go to Settings to activate W
27:39 / 2:11:42

Dr Onkar Sahasrabudhe
Activate Windows



Rough Sketches.
MASK
Design_1 was deficient of perfect ventilation . Could have caused breathing problems.
Design_2 was nearly a perfect design but due to some small defects it was modified into a final design.
Design_3 this design is more ergonomic and does satisfy the basic key points of a good mask.
SEMechA327...
Activate Windows
Go to Settings to activate Wi
48:26 / 2:11:42



SEmechA350 SHREYASH KELJI
Activate Windows
Go to Settings to activate
Exit
1:33:04 / 2:11:42


Stages of design
Stage 3: - (Passed)
In this design we retained the design of the previous stage and added an adhered rubber skirting aroung the mask body so that it creates a perfect seal around the mouth and the nose. We also decided to make an adjustable head strap to go along with the mask and the goggles which makes size difference negligible for all face types. The filters in this mask are 3M face mask filters which is standard for various masks available in the market.
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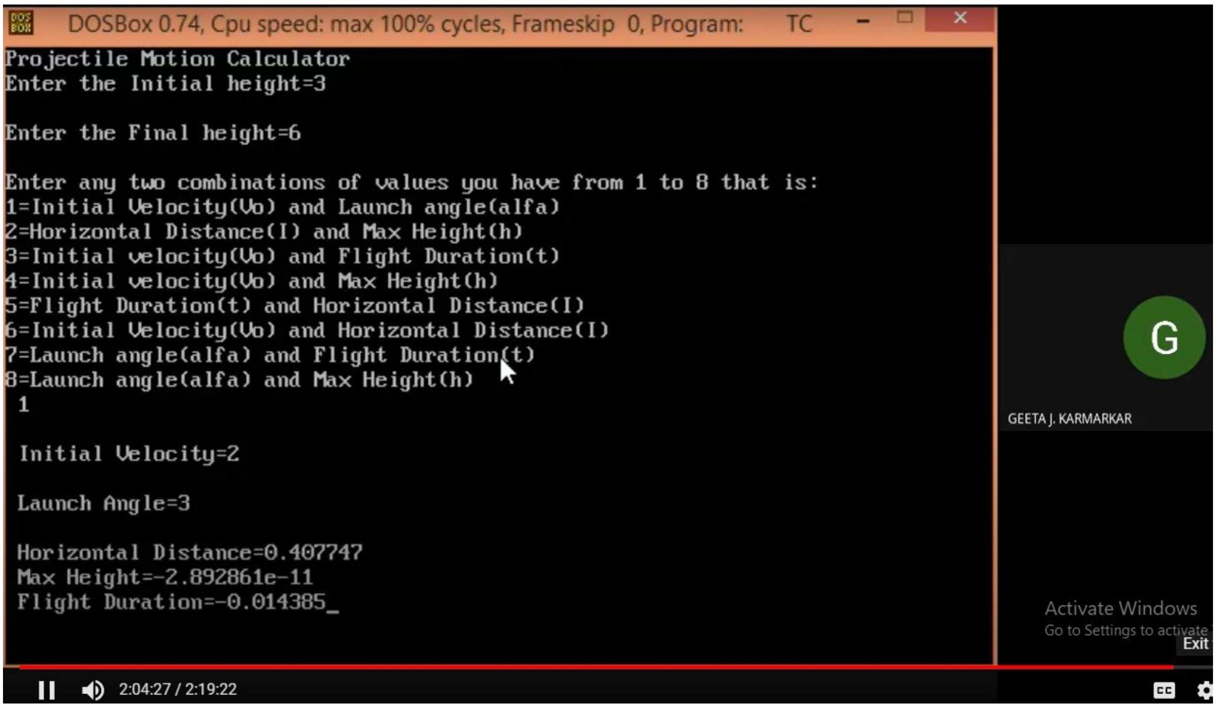
SEMechA303 Aniruddh Achary
Activate Windows
Go to Settings to activate W
2:02:43 / 2:11:42


DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC
Projectile Motion Calculator
Enter the Initial height=3
Enter the Final height=6
Enter any two combinations of values you have from 1 to 8 that is:
1=Initial Velocity(Vo) and Launch angle(alfa)
2=Horizontal Distance(I) and Max Height(h)
3=Initial velocity(Vo) and Flight Duration(t)
4=Initial velocity(Vo) and Max Height(h)
5=Flight Duration(t) and Horizontal Distance(I)
6=Initial Velocity(Vo) and Horizontal Distance(I)
7=Launch angle(alfa) and Flight Duration(t)
8=Launch angle(alfa) and Max Height(h)
1
Initial Velocity=2
Launch Angle=3
Horizontal Distance=0.407747
Max Height=-2.892861e-11
Flight Duration=-0.014385_
G
GEETA J. KARMARKAR
Activate Windows
Go to Settings to activate
Exit
2:04:27 / 2:19:22