Assessment

Exam: 50% (Case study, facts, numerical and theory)

Lab exercises individual : 30%

-Fill 4 workbooks and submit

Mars colony challenge : 20%

-Manual Control or Autonomous Control or Semi-autonomous (5%)

Group submission: (Voice over powerpoint, 3D CAD files, codes) (15%)

-Peer assessment form (Weightage)

Final deadline: 28th of March.

MARS colony scenario:

Imagine the year is 2035. You have used SpaceZ rockets to reach mars where you are still orbiting the mars in your space station while robots you built were sent down to build a mars colony.

You will build toy robots to reflect this scenario. The robots you use will be built during the regular lab exercise. For this case you must design an end effector which will attach to your robot. 1-additional micro-servo will be provided to you for this task. The test scenario and a simulation environment will be provided to you. You will be shown the actual test bed where you will have the opportunity to test your robot. You must manoeuvre the robot manually/autonomously and finish mission of moving 10-gram building blocks avoiding obstacles.

The project is a high-risk at the same time fun way of learning. So, mission completion will contribute to only 5% of the 20% component considering the high-risk element. The rest 15% will be based on your technical approach, implementation, teamwork, presentation.

The project work is assessed as a group taking into consideration your contribution within the group. Please use the provided assessment grid to help guide you as to what is required for each grade. An element of peer assessment will be factored for marking.

Two missions

- Martian Pick and drop
- Martian Race

Project (Presentation + CAD + Code (20%))

- Presentation (5%)
- Demonstration (5%)
- Presentation style (5%)
- Design and implementation (5%)

Weighted with peer assessment component*

Group learning-Not group work

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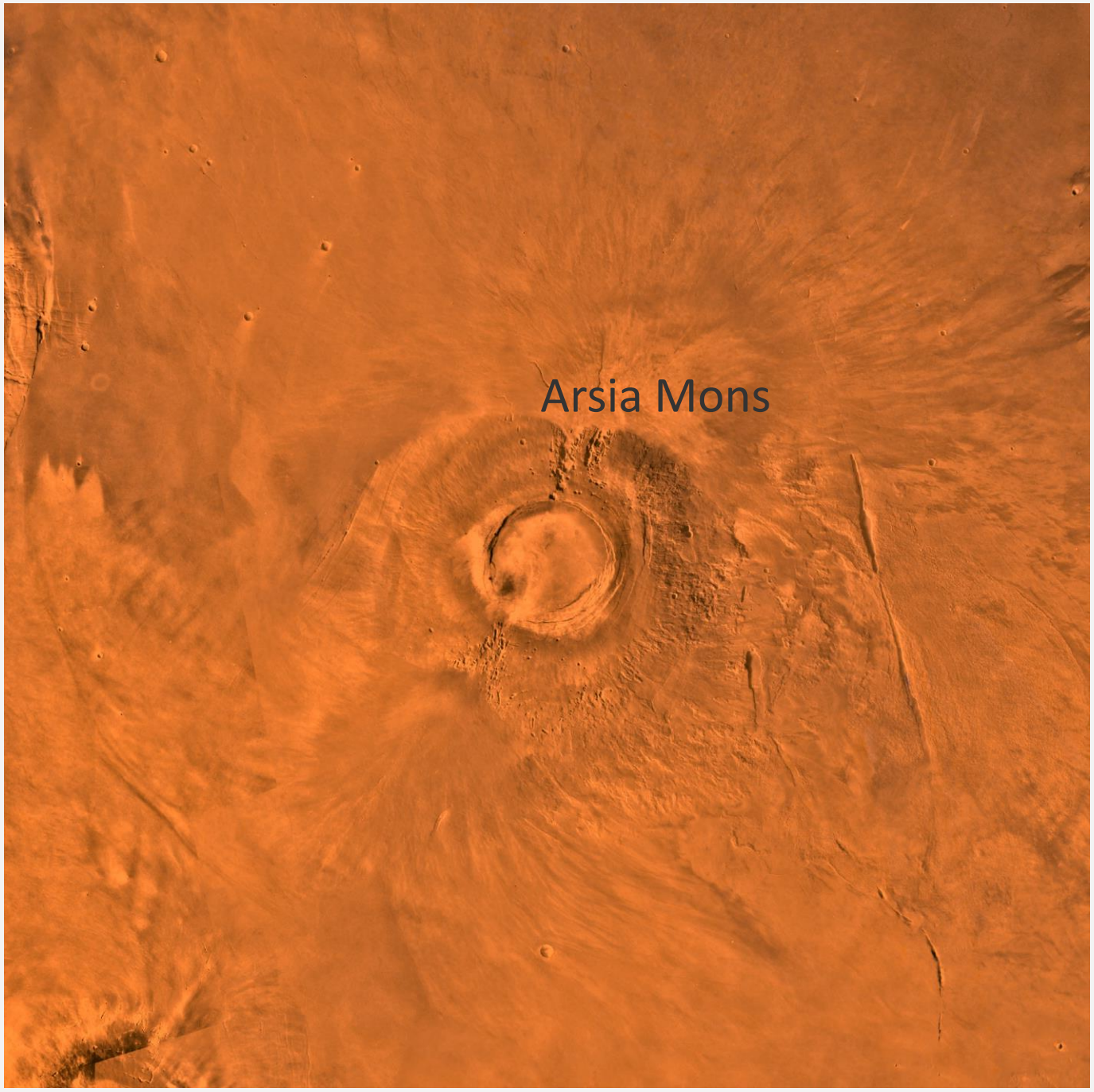
Group learning-Not group work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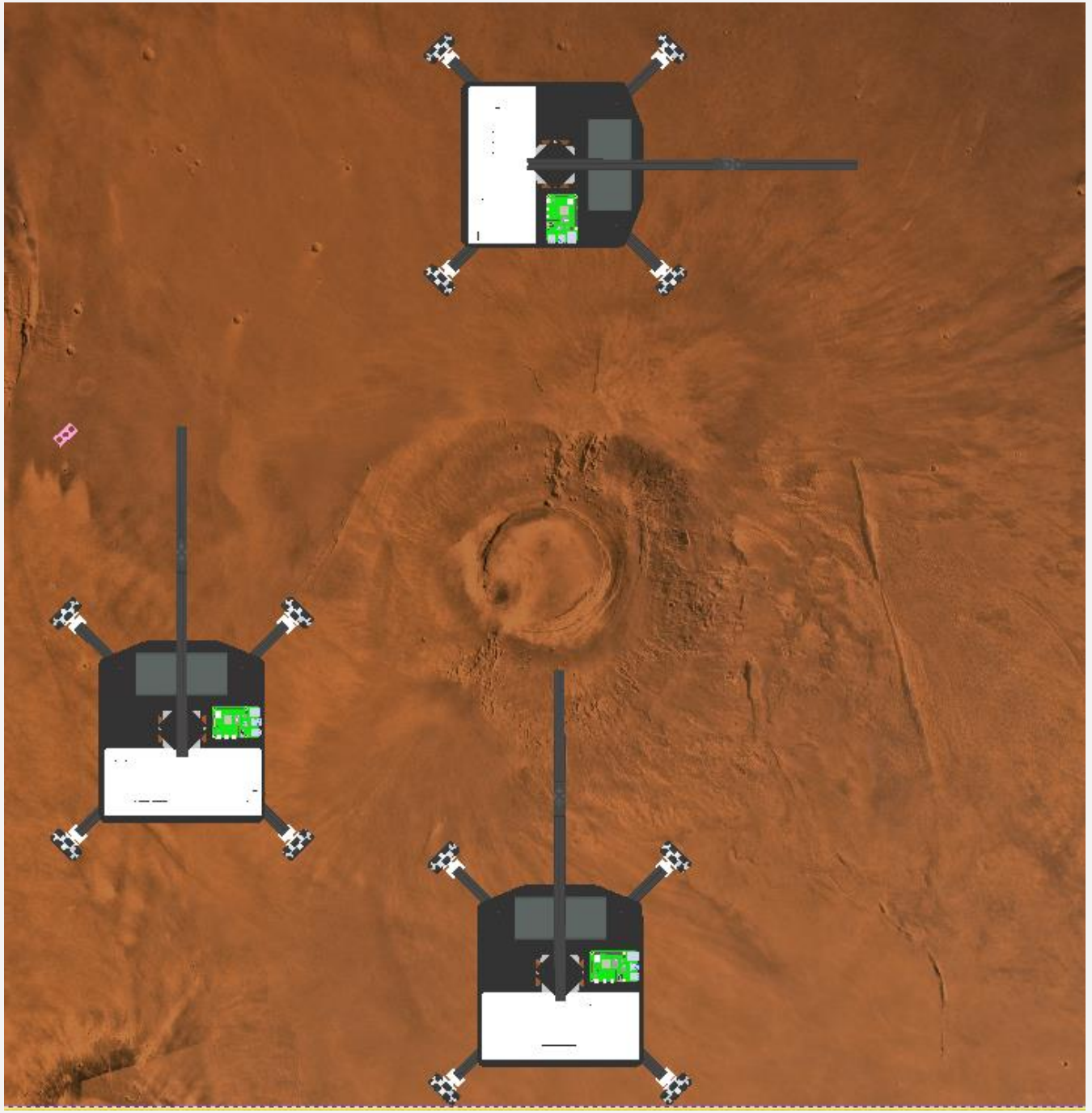


March 26th-Demo Day

- Prior input: Map with obstacles

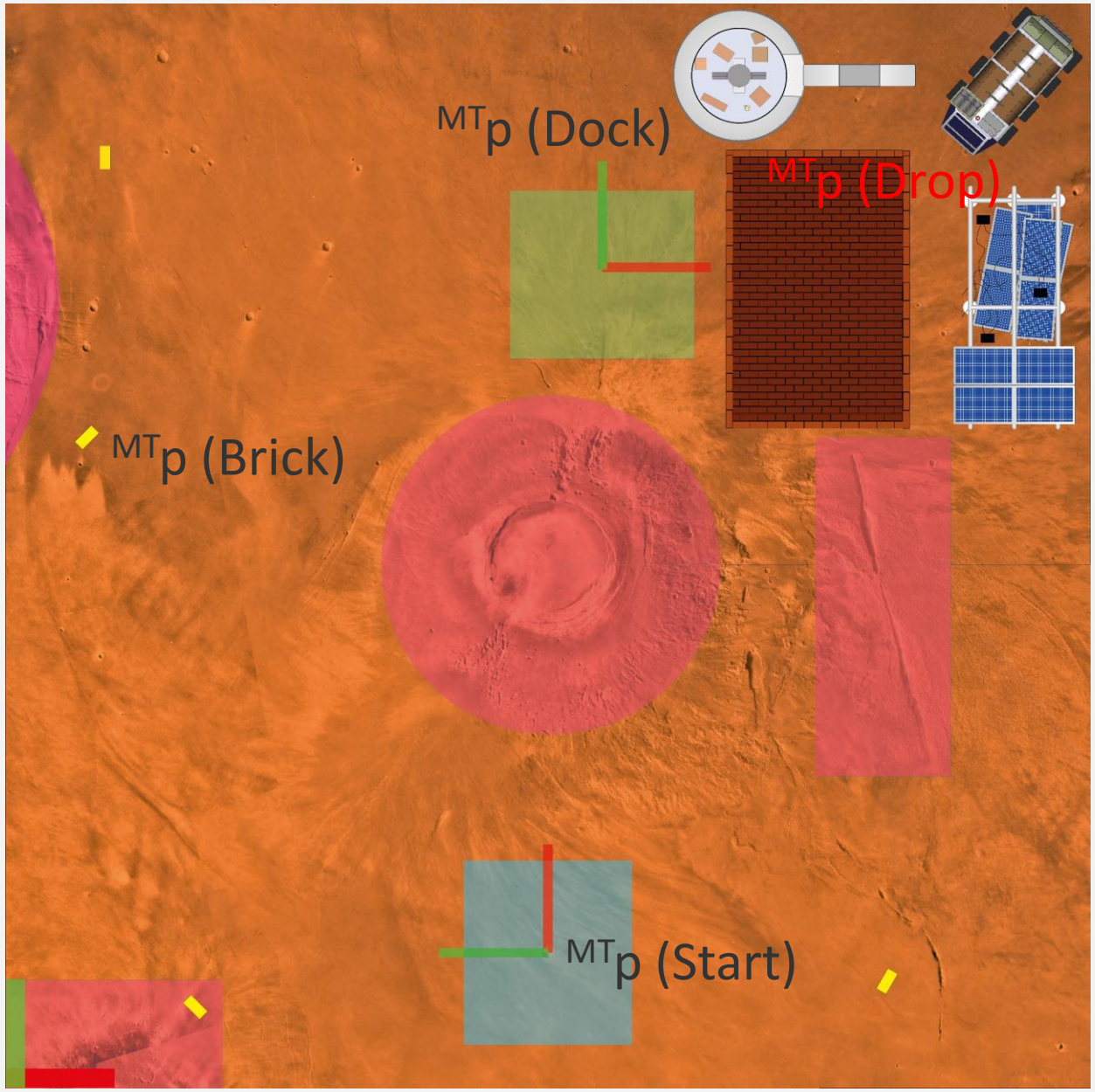
  ^{MT}p (Start)=(1.0, 0.25, 0.0)

  ^{MT}p (Brick)=(0.15, 1.2, 0.0)

  ^{MT}rpy (Brick)=(0.0, 0.0, -45^0)

  ^{MT}p (Dock)=(1.1, 1.5, 0.0)

- Live input: Position in MT frame to drop the brick ^{MT}p (Drop)



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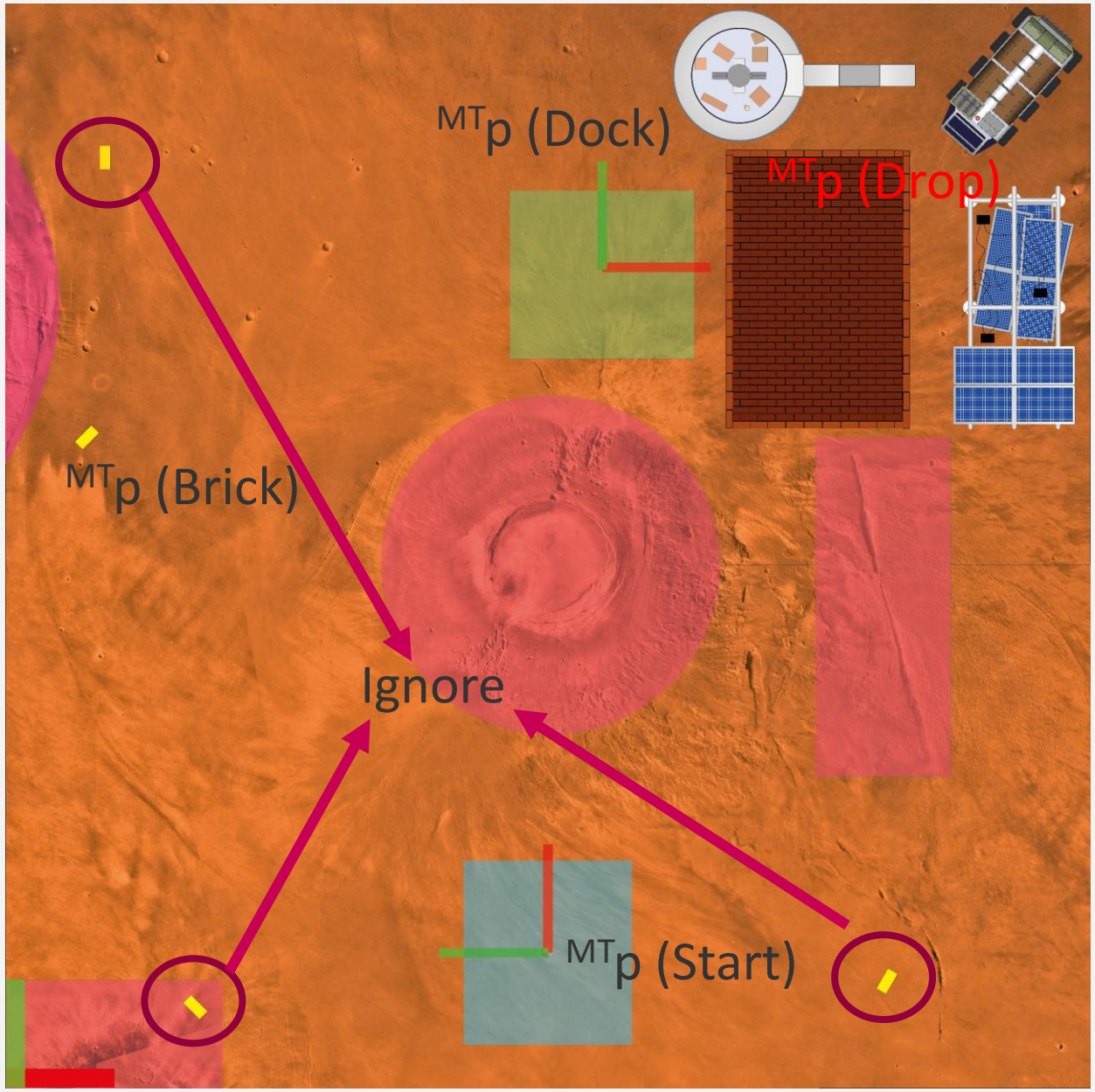

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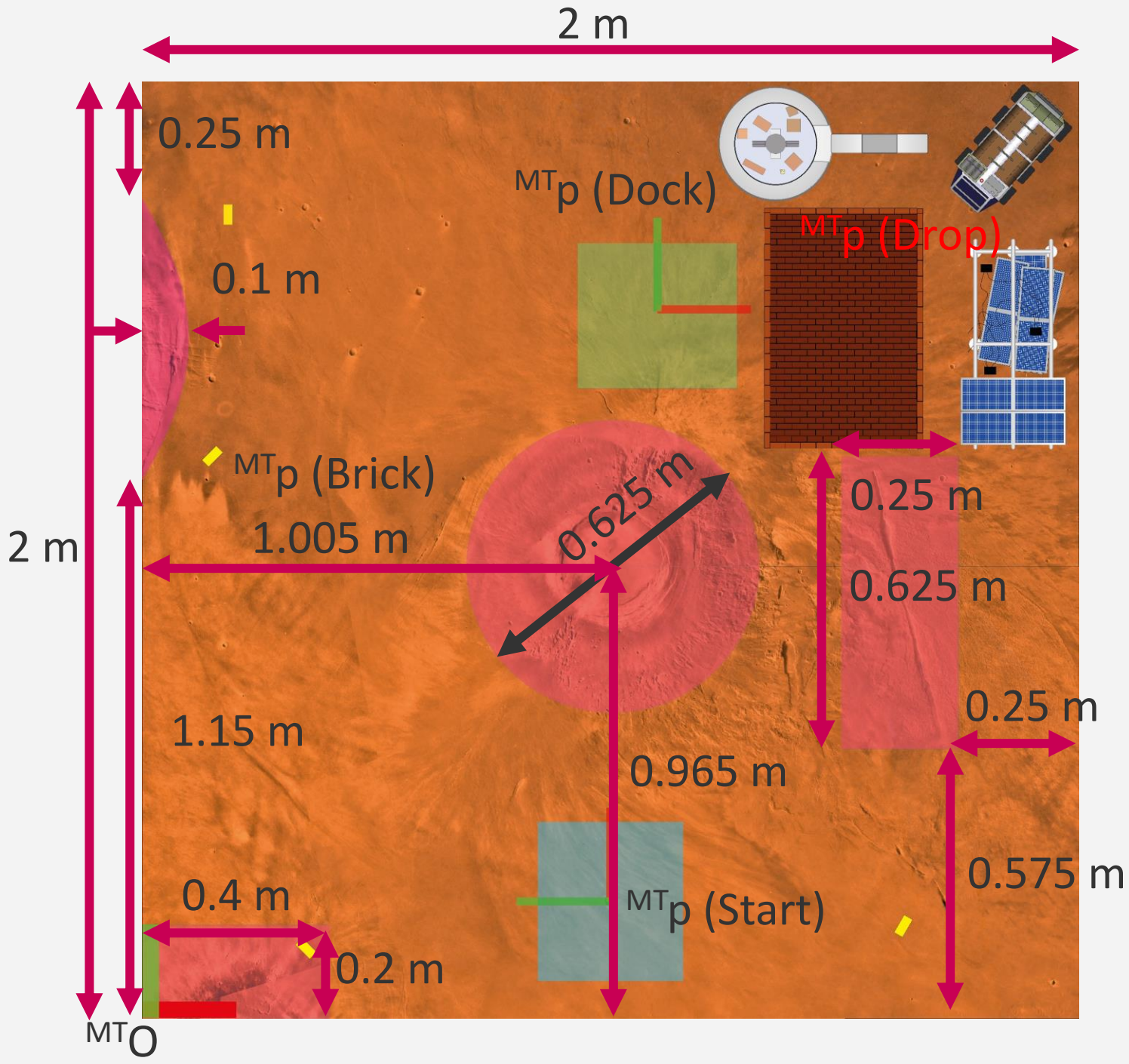


Mission in 5 steps-2 tries per team

Manual or Autonomous or Semi-autonomous – 15 mins total for the 2 tries

Manual round:

- Start
- Navigate
- Pick the brick
- Dock
- Drop the brick

Auto round:

- Start
- Navigate
- Pick the brick
- Dock
- Drop the brick

Minimum 0-Maximum 2.5

- Start with 1.25 points
- Robot did not move (-1.25 points)
- Robot went into obstacle or went out (-0.25 x Times points)
- Navigated (+0.25 points)
- Navigated and did not hit the obstacle (+0.25 points)
- Robot navigated and picked (+0.25 points)
- Robot navigated, picked and dropped after docking (+0.25 points)
- Dropped at right location (+/- 5 cm) (+0.25 points)

Two missions

- Martian Pick and drop
- Martian Race

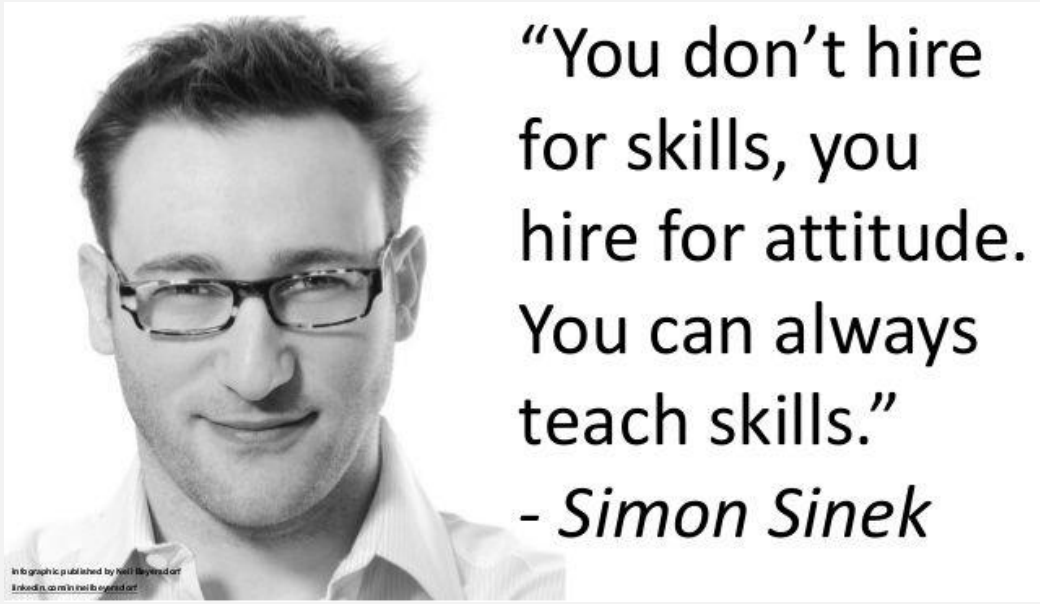
Followed by a Voice Over presentation of your approach.

Minimum 0-Maximum 2.5

- Start with 0.5 points
- Robot did not move (-0.5 points)
- Robot went out of track (-0.25 x each time)
- Laps (+0.25 x 4 quarter lap x 2 laps points)

Top 10 Soft Skills

- **Strong Work Ethic**
- Dependable
- **Positive Attitude**
- Self Motivated
- TEAM ORIENTED
- Organized
- WORKS WELL UNDER PRESSURE
- Effective Communicator
- Flexible
- **Confident**



Category	Name					
	Self					
Positive Attitude						
Dependable						
Self-Motivated						
Team Oriented						
Organized						
Works well under pressure						
Effective Communicator						
Confident						
Flexible						
Strong Work Ethic						

Background review						
References and citations						
Provided initial design(s) and CAD						
Design optimisation/CAD (name)						
Coding (Include Python code, URDF, forward kinematics, inverse kinematics, ROS Interfacing, Navigation, mapping, and SLAM, Pick and place manoeuvring)						
Physical implementation of robot- Actuation and drives (calculation or practical implementation), assembly and Testing						
Presentation slides preparation						
Figures/images preparation for presentation						
Delivery						
Any other contributions can be added below (Feel free to add more row(s)):						

II Assessment criteria

Lab exercises-Workbook (30%) (a weighted average will be used to determine the final grade):

Elements	1	2:1	2:2	3	Fail
Code or code elements	Excellent comment well formatted code or code elements. Code works correctly.	Good comments. Code works correctly.	Some comments are there. Code partially works	No comments. The code does not work	No code.
Data	Data is clearly shown in table format and is neat and easy to read.	All data is present but messy and difficult to read	More than 20% of data is present	80% of data is missing	Data is missing
Graph	Graph has a relevant title and Axis are labeled with variable and unit. Unit is in parenthesis behind variable. Graph has an appropriate scale on both x and y axis.	Graph is missing title or one Axis Label, or variables don't include units and Graph has an appropriate scale on either x or y axis.	Graph is missing title or one Axis Label, or variables don't include units or Graph has an appropriate scale on either x or y axis.	Graph is missing two or more of the requirements. Neither scale is appropriate.	Graph is missing.
Images	Images are clear, sufficiently large with good resolution, and clearly labeled. Any images/tables/diagrams used add value.	Images are mostly clear, large with good resolution, and clearly labeled. Images/ tables/diagrams used where appropriate.	Some weaknesses in presentation of images. Relevance of images/ tables/diagrams not always clear.	Images poorly presented. Some necessary images missing.	Insufficient or missing images.
Descriptions (Language)	Excellent spelling and grammar.	Some minor errors in spelling and/or grammar.	Frequent errors in spelling and/or grammar OR English is too informal.	Numerous errors in spelling and/or grammar	So many errors that meaning is unclear
Descriptions (Technical)	The description implies an exceptional knowledge and understanding of the underlying concept(s) and able to apply facts/concepts to practical scenario.	The description implies reasonable knowledge and understanding with some ability to apply to known/taught contexts	There is some clarity in the description but the structure is not coherent.	Knowledge and understanding is sufficient to deal with terminology, basic facts and concepts but fails to make meaningful synthesis;	Implies insufficient knowledge or no description provided
Analysis /discussions	Analysis /discussions are complete and show the student has good understanding	Analysis /discussions are mostly complete	Analysis/discussion is attempted but it implies a moderate understanding	Analysis /discussion is attempted but it implies a poor understanding	Analysis /discussion is missing
Numerical Problems	Equations are rightly used, the units are correct and the solution is correct	Equations are rightly used. The solution is correct. But the Units are missing or incorrect	NA	NA	No solution or incorrect equations.
Conclusion/Reflection	Conclusion/Reflection summarises the main points and discusses the broader interpretation of the information presented and the key learnings.	Conclusion/reflection summarises the main points and shows awareness of the broader interpretation of the information and the key learnings.	Conclusion summarises the main points and shows some learnings.	Little attempt to summarise.	Trivial or no conclusion or reflection

Course project (20%) (a weighted average will be used to determine the final grade):

Marking criteria		1	2:1	2:2	3	Fail
Presentation + CAD + Code (20%)	Presentation (5%)	Communicates all key information in an eye-catching and visually attractive way. The material is laid out logically with a natural flow. All Images are high quality and add value. Text sections are concise and pertinent. Technically good quality videos were used were appropriate to justify the output.	Communicates information in a visually attractive way. Clear and logical. Appropriate high-quality images used. Text sections are concise. Videos were used.	Conveys information adequately, but it is marred by omissions or errors, or is laid out in a way that detracts from the content (e.g. misplaced emphasis). Text sections are too long or too dense.	Sufficient information to communicate the essence of the project but there are obvious omissions. Presentation marred by major errors, brevity, irrelevance or poor design OR Presentation consists solely of sections copied from the academic paper.	Insufficient material. Poorly presented.
	Demonstration (project size and achievement) (5%) *100 hrs including the lab exercises time	A substantial project involving a significant piece of work and the solution of difficult problems requiring mathematical analysis. Excellent demonstration of manual control, mobility and manipulation. Aim met/exceeded OR failures fully analysed and understood and innovative alternative approaches proposed.	The size of the project fully equates to the allocated time of 100hrs for a professional engineer. Some problems required quantitative analysis. Good demonstration of manual control, mobility and/or manipulation. Aim met OR project turned out harder than anticipated and actual progress was good OR failures analysed, and a sensible alternative approach suggested.	The work could have been completed in around 50 hrs. No quantitative analysis. Problems tackled were straightforward and qualitative in nature. Some demonstration of manual control, mobility and/or manipulation. Aim partially met. No evidence of meaningful failure analysis.	The work could have been completed in less than 50 hrs. No significant problems were solved. Weak demonstration of manual control, mobility and/or manipulation. The outcome suggests some limited progress towards the aim OR errors responsible for failures.	Little attempted. No meaningful product or outcome. No demonstration.
	Presentation style (5%)	Engaging delivery without hesitation. Practiced and polished, well-timed.	Natural delivery. Minor hesitations do not have a negative impact on the listener. Appropriate length.	Some hesitations or "filler" words, but overall flow maintained. A bit short OR rushing to finish on 15 mins time.	Stilted delivery or vague and rambling style. Too short.	Mumbling. Issues with speed/ tone. Very short.
	Design and implementation (5%)	A critical assessment of initial designs with an excellent justification for the final end effector design; highly relevant techniques have been adopted and their use is very well supported in the report; description of work is complemented by excellent diagrams; Excellent comment well formatted code or code elements. Code works correctly.	A critical assessment of initial designs with a good justification for the final design; relevant techniques have been adopted and their use is supported in the presentation; description of work is complemented by good diagrams; Good comments. Code works correctly.	Initial designs are presented with fair justification for the final design; techniques used are relevant and their use is somewhat supported in the presentation; description of work is complemented by acceptable diagrams; Some comments are there. Code partially works	The assessment of initial designs is acceptable and final design is somewhat justified; techniques used are acceptable and discussion in the presentation is acceptable; description of work is complemented by acceptable diagrams; No comments. The code does not work	The assessment of the initial designs is poor or not provided; techniques used in the design has not been presented; description of work is not complemented by diagrams; No code

Assessment Criteria

https://now.ntu.ac.uk/d2l/le/content/965686/viewContent/12349290/View