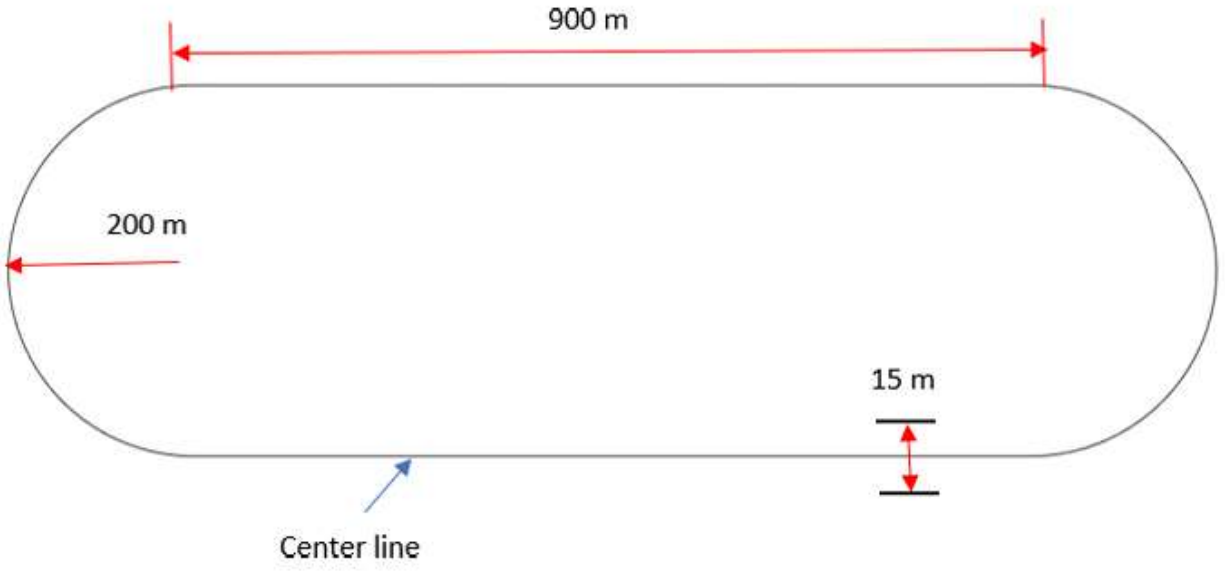
# Project 2 Description and Deliverables

**Description:** Build a (lateral) dynamic model of a vehicle so it can go around a race track. Determine how fast you can travel around the loop

| Project Timeline | Due Date |
|---|---|
| Week 1 – Weekly Progress | 14 Feb 2026, 11:59 PM |
| Week 2 – Weekly Progress | 21 Feb 2026, 11:59 PM |
| Week 3 – Project Submission | 28 Feb 2026, 11:59 PM |

**WEEK 1: Project 2**

This week, you will be asked to complete the following:

- In MATLAB, plot a race track which is divided into four main sections. The two curved sections have a radius of 200 meters and the length of the two straightaways is 900 meters. The width of the track is 15 meters. **NOTE:** It is advised not to simply plot two semi-circles and two straight lines. This will make the following weeks more difficult. Think of a way to plot this as a continuous line starting at (0,0) and ending at (0,0).
- 

- Now plot a square/rectangular patch to simulate a vehicle going around the track. This patch will follow all waypoints of the center line above. The patch will rotate when steering through the curves and straight back up to the center position on the

straightaways. You will also need to plot the vehicle's path

  - Hint on creating patches: https://www.mathworks.com/help/matlab/ref/patch.html#responsive_offcanvas
  - Hint on animating lines: https://www.mathworks.com/help/matlab/ref/animatedline.html

- In a README.md file, write a short report (~150 words) that summarizes what has been done and provides instructions for running and checking
- Commit and push all work into your Team Leader's repository by **11:59 PM on Saturday**. This will allow time for the TA to assess your weekly progress. Commit with the message **"Project 2 Week 1 Submission"**

**WEEK 2: Project 2 (Continued)**

- For this week, you will develop and add more lateral dynamic components to your Project 2 so that your vehicle model will complete one lap as fast a possible without getting out of the track width (15m)
- Select your target speed and determine how fast your vehicle model can go around the track
- In the "Driver Model" subsystem of your Simulink model, develop a lateral control to estimate the steering angle (delta_f)
- Develop a "Lateral Dynamics" subsystem that considers tire slip and tire forces to estimate the lateral velocity (v_y) and vehicle heading (psi)
- Develop a "Transformation/Rotation" function to transform and output the X and Y coordinates. Then use a "XY Graph" block to plot the vehicle path
- Complete the loop by feeding the X, Y and heading back to the Driver Model subsystem
- Update the README.md file with a short report (200-300 words) that summarizes what work has been done and provides instructions for running and checking
- Commit and push all work into your Team Leader's repository by **11:59 PM on Saturday**. This will allow time for the TA to assess your weekly progress. Commit with the message **"Project 2 Week 2 Submission"**

**WEEK 3: Project 2 (Continued)**

- Use "To Workspace" blocks to output data to MATLAB
- Use the X, Y coordinates, heading, the race track and vehicle developed in Week 2 to simulate the vehicle going around the track
- Provided a "raceStat.m" file which is used to determine number of loops completed, completion time and whether the vehicle is out of the track or not. Add and run this statistics script on your script.
    - **NOTE:** It will take the X, Y coordinates, Time, and Track Dimensions
    - Track Data:
        - track.radius = 200; % Radius of Curves
        - track.width = 15; % Width of the Track
        - track.l_straightaways = 900; % Length of Straightaways
- Update the README.md file with a final report (200-300 words) that summarizes what has been done and provides instructions for running and checking. Explain your findings about the project and describe how your model meets the requirements. Does the vehicle stay in the track? If not, then explain why.
- Commit and push all work into your Team Leader's repository by **11:59 PM on Saturday**. This will allow time for the TA to assess your weekly progress. Commit with the message **"Project 2 Final Submission"**
- Submit the Peer Evaluation Form on Canvas

# Project 2 Week 2 Deliverables – DUE 02/14 @ 11:59 PM

By now your team should have accomplished the following:

- Generate track waypoints that correspond to the track information that was given
- Animate some sort of square/rectangular patch that follows the track waypoints and plots the car path as it animates.

For Week 2, your team will now be utilizing a Simulink model to develop and add lateral dynamic components so that your vehicle will complete one lap as fast as possible without getting out of the track width.

1. Your team will select a target speed and determine how fast your vehicle model can go around the track.
2. Create a "Driver Model" subsystem within the Simulink model where there will be a lateral control to estimate the steering angle (delta_f)
3. Develop a "Lateral Dynamics" subsystem that considers tire slip and tire forces to estimate the lateral velocity (v_y) and vehicle heading (psi)
4. Develop a "Transformation/Rotation" function to transform and output the X and Y coordinates. Then using a "XY Graph" block, plot the vehicle path
5. Complete the loop by feeding the X, Y, and heading back to the Driver model subsystem
6. Update the README.md file with a short report (200-300 words) that summarizes what work that has been done and provides instructions for running and checking
7. Commit and push all your work into your Team Leader's repository by 11:59 PM on Sunday. This will allow time for the TA to assess your weekly progress. Commit with the message "Project 2 Week 2 Submission"

# Project 2 Final Week Deliverables – DUE 02/21 @ 11:59PM

- Continuing off the model that you have been developing for the past two weeks.
- Use "To Workspace" blocks to output data to MATLAB
- Use the X, Y coordinates, heading, the race track and vehicle developed in Week 2 to simulate the vehicle going around the track
- Provided a "raceStat.m" file which is used to determine number of loops completed, completion time and whether the vehicle is out of the track or not. Add and run this statistics script on your script.
  - **NOTE:** It will take the X, Y coordinates, Time, and Track Dimensions
  - Track Data:
    - track.radius = 200; % Radius of Curves
    - track.width = 15; % Width of the Track
    - track.l_straightaways = 900; % Length of Straightaways
- Update the README.md file with a final report (200-300 words) that summarizes what has been done and provides instructions for running and checking. Explain your findings about the project and describe how your model meets the requirements. Does the vehicle stay in the track? If not, then explain why.
- Commit and push all work into your Team Leader's repository by **11:59 PM on Sunday**. This will allow time for the TA to assess your weekly progress. Commit with the message **"Project 2 Final Submission"**
- Submit the Peer Evaluation Form on Canvas