

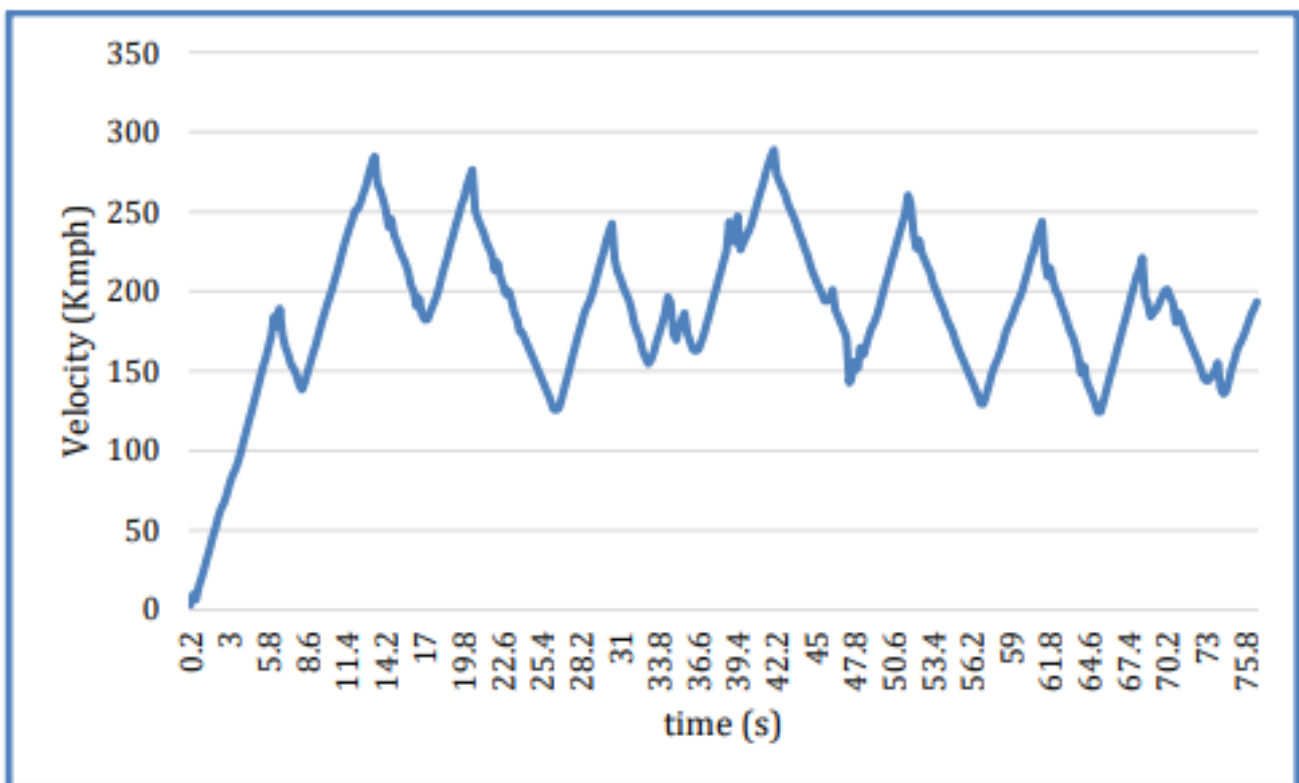


Course name	Numerical Modeling & Simulation in Scilab Xcos
Lesson name	Numerical Modelling Formula 1 Vehicle Resistive Forces in Scilab-Xcos
Lesson objective	Practice blocks & acquaint to use GUI of Scilab-Xcos
Created by	Nikita Punjabi

Problem statement: Model the Formula 1 Vehicle Resistive Force in Scilab-Xcos to plot the vehicle resistive force.

Using Track_1.csv

Track Drive Cycle Graph:



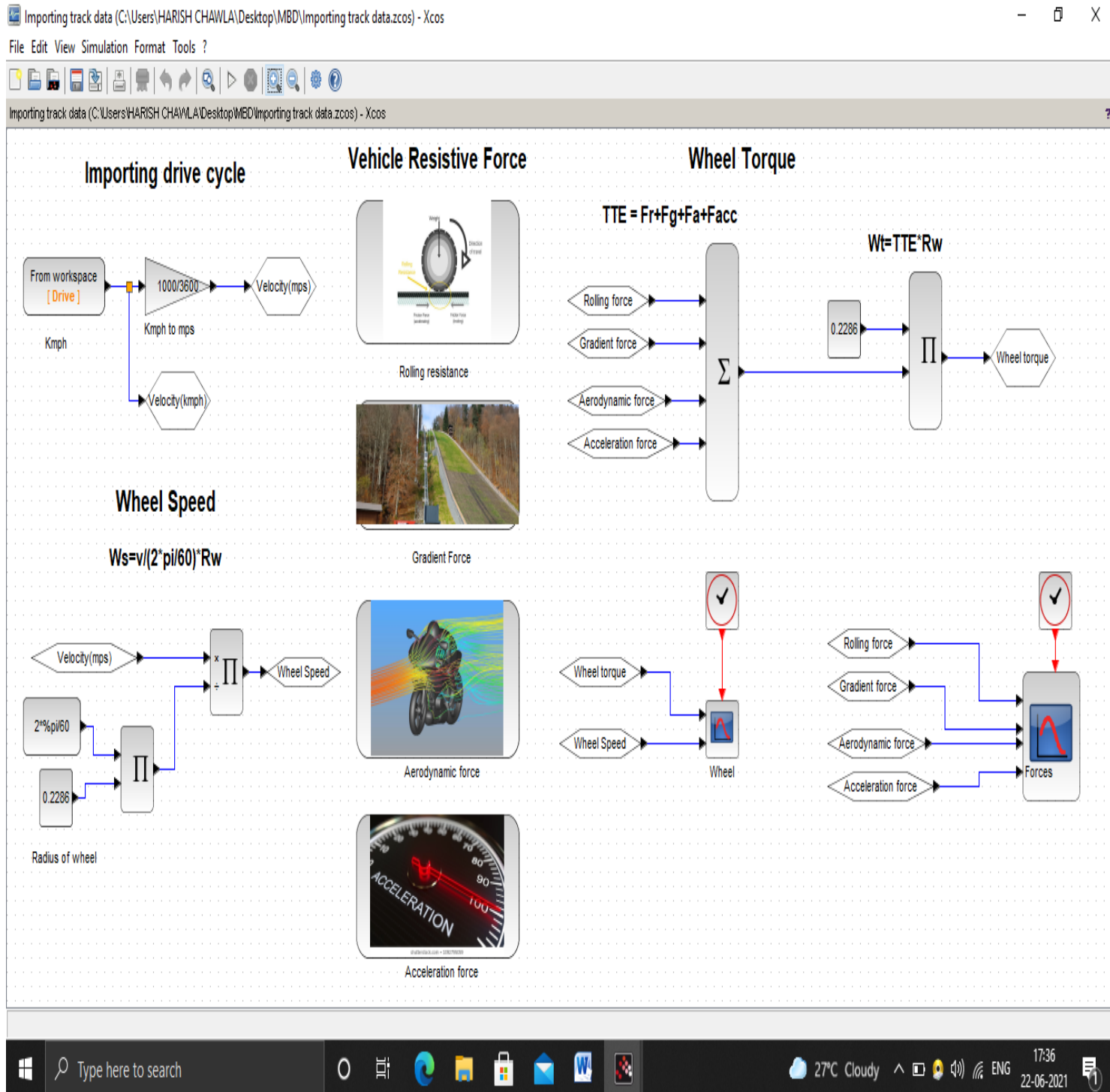
Model Inputs:

Sr No	Parameter	Value	Units
1.	Chassis		
2.	I. Coefficient of rolling resistance	0.015	
3.	II. Gross Vehicle Mass	900	Kg
4.	III. Gravity constant	9.81	m/s
5.	IV. Grade Angle	0	degree
6.	V. Area	1.8585	m ²
7.	VI. Air Density	1.225	Kg/m ³
8.	VII. Drag Coefficient	0.9	
9.	VIII. Radius of wheel	0.2286	m

Program:

A. To Import Track Data:	B. To define all input parameters:
<pre>data = csvRead("Track_1.csv") Drive.time = data(3:384,1) Drive.values = data(3:384,2) value=csvRead("Grade Data.csv") Grade.time=value(3:470,1) Grade.values=value(3:470,2)</pre>	<pre>//Coefficient of rolling resistance Crf = 0.015 //Gross Vehicle Mass GVM = 900 //kgs //Gravitational constant g = 9.81 //Gross Vehicle Weight GVW = GVM*g //Frontal Area A = 1.8585 //Air Density rho = 1.225 //Coefficient of Drag Cd = 0.9 //Radius of the wheel Rw = 0.2286</pre>

Model:



Results:

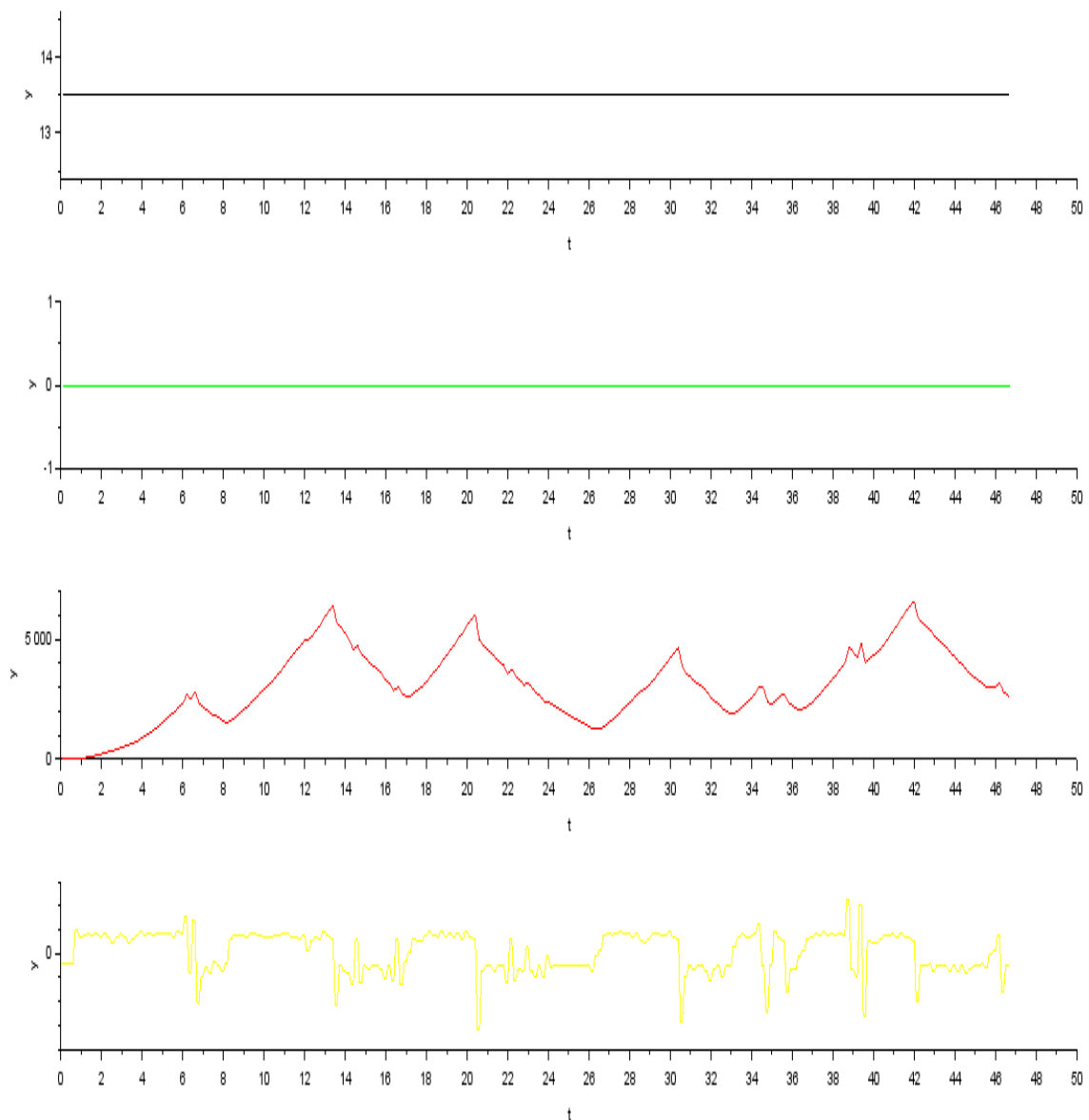
Vehicle Resistive Forces

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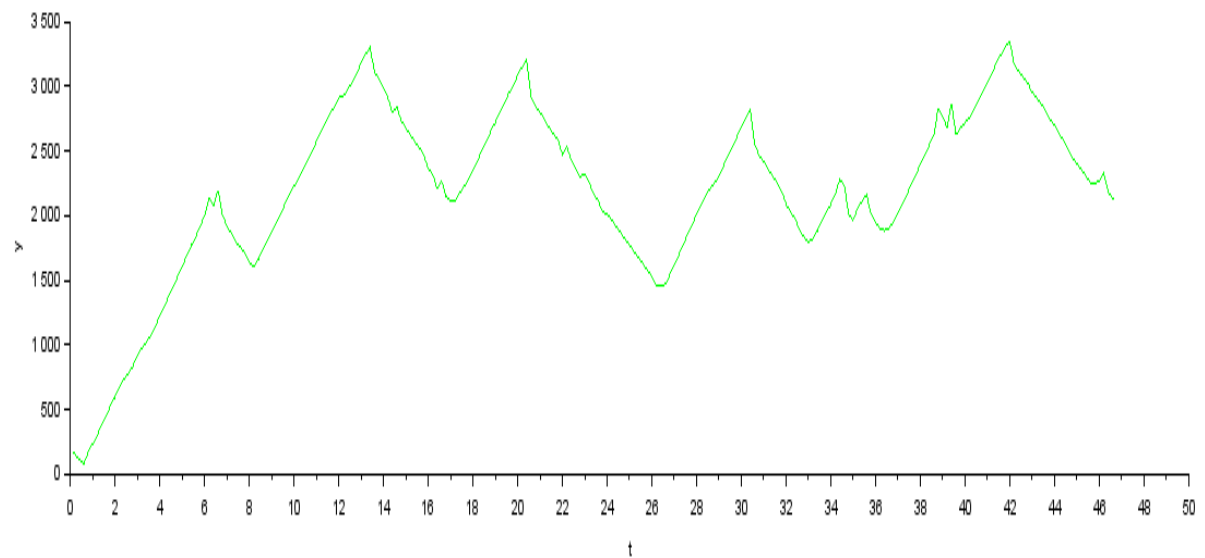
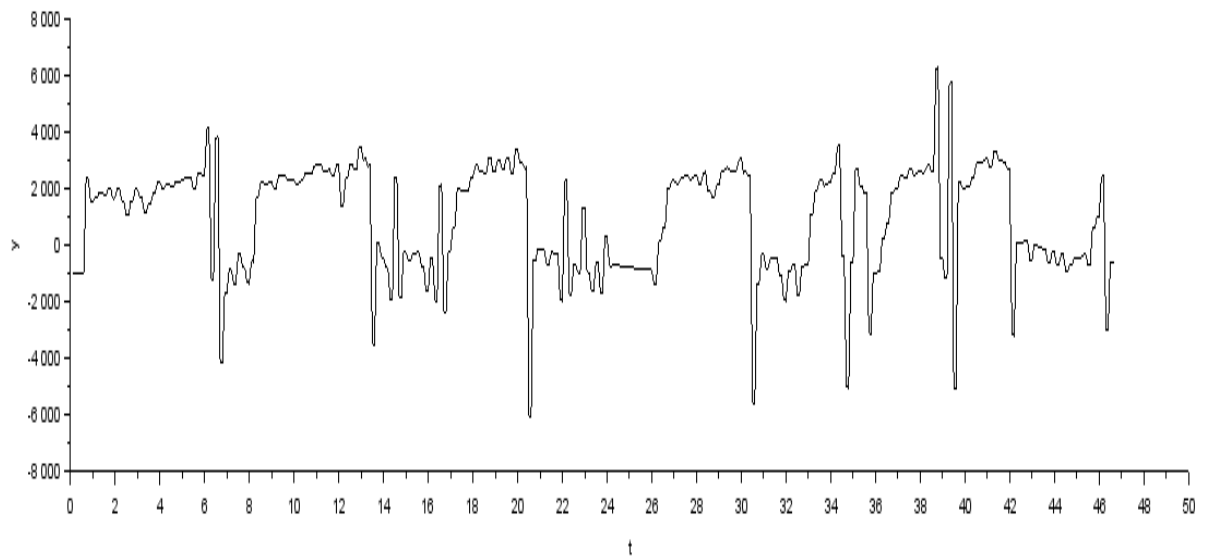
Wheel

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Conclusion:

Sr No	Parameters	Values	Units
1.	Chassis		
2.	• Rolling Force	13.5	N
3.	• Gradeability Force	0	N
4.	• Maximum Aerodynamic Force	6500	N
5.	• Maximum Acceleration Force	23000	N
6.	• Maximum Wheel Speed	3400	Rpm
7.	• Maximum Wheel Torque	6200	Nm