Vehicle dynamics

1. Static weight distribution, and its modifying factors
* Axle loads in steady, leveled condition.
* Ale loads during acceleration, climbing uphill, during tow, and caused by air resistance
* Inclination resistance
1. Cornering, weight distribution, side-skidding, and roll-over limits
* Force balance during cornering. Centrifugal, centripetal forces
* Determining the yaw-rate
* Rolling balance, skidding balance
1. Pull-force balance, resistances
* Components of the pull force balance equation, and
* Detailed explanations of the components.
1. Pull diagram, and consequences
* Pull force, and vehicle speed equation from engine, vehicle, and tyre data.
* Draw the pull force curves for at least 3 gears.
* Draw the resistance curves
* Draw the theoretical ideal pull-force hyperbole, and explain
* Draw conclusions about maximum speeds (theoretical, and practical)
1. Longitudinal slip, and tire forces
* Slip definitions for pull, and brake
* Explain the origin of the slip phenome
* Is slip a loss?
* Show normalized the tire forces in the range s:[-1,1], and explain stable, and unstable ranges
* Explain additional braking effect for certain soil types
1. Lateral slip, and side force
* Lateral slip definition (side-skidding angle)
* Explain the origin of the sike-skidding phenome
* What influences the side-skidding?
* Which vehicle dynamic property is being influenced by side-skidding?
1. Ackermann condition of turning.
* Explain Ackermann condition on a drawing of a 4-wheeled vehicle
* Explain the steering angle differences between inner and outer wheels.
* Determine the outer wheel steering angle based on the inner wheel angle
1. Neutral-, over-, and understeering conditions
* Create drawings for the 3 cases
* Explain the conditions based on the side skidding angles
* Show the steering wheel angle as a function of vehicle speed for the 3 cases
1. Multi-mass dynamic models of vehicle suspension
* Draw models for 1, 2, 3, and 5 mass models.
* Which model is used for which type of modelling?

1. Differential equation modelling of vehicle dynamics.
* Draw an at least 2 mass vehicle modell
* Set up the motion equations
* Write up the differential equation (at least 2nd order)
* Create a block modell based on the differential equation.
* Explain the solution possibilities of the modell created.
1. Suspension, and wheel geometry.
* Toe, -
* Castor,
* Camber, and
* Kingpin inclination."
1. Stability programs.
* Longitudinal ABS, ASR,
* Lateral: ESP (DSC...)"
1. Tire-road modelling.

- linear models,

- Brush-wheel model

- mathematical models (Magic formula, magic trick)"