

### ME41116 Group Project Description

The Group Project is an important component of this course to analyze and design of vehicle / subsystem controller using the various software tools. The group project (up to 3-4 students and self-enrollment via Brightspace) provides the freedom for the students to design own system or investigate specific research questions related to the course materials. The design choice is under the students' responsibility. To reduce potential risk of problem underestimation, it is strongly recommended to discuss the selected topic with the instructor to identify potential pitfalls during online office hours.

Main focus of the project should be on control applications for vehicle / subsystem dynamics.

The project includes two stages:

- literature survey on the selected topic;
- controller design, implementation, simulation, and analysis.

The project is based on:

- provided roll-axis vehicle model
- or
- commercial software IPG CarMaker (*recommended for VE D&C students*).

The project should cover the following points:

- 1) Formulation of problem statement including:
  - description of research problem, objectives and test object;
  - definition of response variables.
- 2) Findings from literature survey
- 3) Mathematical description of the developed controller according to the project targets;
- 4) Test maneuver(s) description;
- 5) Evaluation of the respective response variable if applicable;
- 6) Perform data analysis;
- 7) Present your research during presentation sessions (online 10 min presentation + 5 min Q&A).  
The presentation can be also recorded and sent in advance to jury committee for live streaming;
- 8) technical report in IEEE paper format (max. 6 pages + appendix) taking into account feedback from presentation sessions.

The following assessment criteria are used to evaluate project outcome:

- Intro and Problem Statement – 10%
- Content, results and conclusions – 30%
- Presentation – 20%
- Q&A – 10%
- Report – 30 %

The evaluation is conducted by jury committee (the instructor + 2 external members) during presentation sessions. The report is evaluated by the instructor and PhD students.

The report should be submitted **after the presentation sessions and before the written exam**.

Examples of the project topics

- Performance Comparison of Various Nonlinear Control Strategies Applied to ESC
- Vehicle State Estimation based on Unscented Kalman Filter
- Path-following using sliding mode control
- Torque Vectoring Control: A Comparison of Different Control Strategies
- Model predictive control for autonomous drifting

An example of successful group project is available on Brightspace.

**The presentation sessions are scheduled on 16<sup>th</sup> June 2020.**

*In the case, if the student retakes the course, the project grade obtained in the past cannot be counted and the student should conduct the group project again.*