Faculty of Applied Sciences

MECA1201   Projet en modélisation et simulation (nouveau cours)

[10h+20h exercises] 2 credits

This course is taught in the 1st semester

Teacher(s):   Paul Fisette, Jean-Claude Samin
Language: French
Level: First cycle

Aims

By the end of the project, the students should be able to establish relevant hypotheses in order to model a complex mechanical system with a view to simulating its dynamic behavior and analyzing the results of that simulation.

Main themes

To establish a relevant hypothesis in order to model a complex mechanical system.
To exploit equations of the kinematics and dynamics of rigid bodies for the development of the model.
To understand a specific law of behavior (example: tire/ground contact model) and incorporate it into the model.
To implement the numerical methods necessary for finding an equilibrium configuration and performing a time simulation of the dynamic behavior of the modeled system.
To present the results in a professional way, to interpret them and explain their limits in view of the chosen assumptions, the nature of the chosen model and the numerical methods implemented.

Content and teaching methods

Choice of a real example of a mechanical system, according to a particular topic suggested (e.g.: a vehicle, a motorbike, a fair machine) and collect useful data;
Establishment of the relevant assumptions for development of a "multibody" model, according to the type of results and the analysis requested;
Development and implementation of the multibody model using the symbolic software ROBOTRAN;
Understanding and implementation via the multibody model of some specific laws of behavior (e.g.: contact model, control, particular space environment);
Development of a Matlab program for the simulation and numerical analysis of the preceding model;
Realization of a graphic model of the system using a CAD software and animation of the system on the basis of the simulations carried out;
Interpretation of the results and critical analysis of the model which has been used: a written report plus an oral presentation of the results.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Prequisite: basic course in Classical Mechanics and Numerical Methods
Format : practicals with groups of students
Assessment : Year long involvement. Written report. Final interview.

Other credits in programs

FSA13BA   Troisième année de bachelier en sciences de l'ingénieur,   (2 credits)
                   orientation ingénieur civil