

Course outline for TMME19 Mechanics, second course, VT2 2020

Lectures and problem seminars

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Computer assignments

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Course literature

Wiesel, E.W., Spaceflight Dynamics, 3ed Aphelion 2010, chapters 1, 4, 5, 6. Earlier editions can also be used.

It is possible to make do with meticulous lecture notes.

Examination

The examination consists of computer assignments in Matlab. There are five assignments, each graded with a maximum score of four points. For grades 3, 4 and 5 a total score of 9, 13 and 17 points, respectively, are required. The assignments are performed individually. The deadline for the computer assignment reports is 2020-06-11. Assignments handed in after this date will be taken into account if needed to reach grade 3, but will not be counted towards grades 4 or 5. Assignments handed in by 2020-05-20 will be returned marked (once) while there are still a few days left before the deadline to prepare a revised version. *Read the instructions for the reports last in this course outline before handing in the reports.*

Programme for lectures and problem seminars

Content

Lect1	Newton's equations of motion. Inertial systems.
Lect2	Coriolis' equation.
Lect3	Particle dynamics in rotating systems.
Lect4	Coriolis' equation, again.
Prob1	5, 1.
Prob2	Individual work: 7, 6, 2, 3, 4.
Lect5	Eqs. of motion for particle systems and rigid bodies.
Lect6	Moment of momentum.
Lect7	The inertia tensor.
Prob3	19, 18.
Prob4	Individual work: 14, 20, 17, 24, 15.
Lect8	Euler's equations. Eqs. of motion with constraints.
Lect9	The euler angles.
Lect10	The euler parameters.
Prob5	9, 10.
Prob6	22.
Prob7	Individual work: 8, 11, 23, 25.
Lect11	Stability of rotation about principle axis of inertia.
Lect12	Gravitational and inertial mass. Newton's argument for absolute space.

Instructions for reporting the computer assignments

The computer assignments are reported in writing, *printed on paper*. The assignments are performed individually. It is permissible to discuss the assignments and to show parts of solutions in that context, but *copying of Matlab code or sections of reports is not allowed*. Further, it is not allowed to possess copies of other students reports or Matlab code either electronically or on paper, or to supply this to another student; this also means that you hand in and pick up your assignments yourself, not with the help of a friend. The reports shall contain:

- Name and complete civic registration number (10 digits) of the student (sometimes called p-number among exchange students).
- The number of the dataset used.
- A short description of the system to be analyzed, with a drawing.
- Answers to all the questions appearing under the headings "Assignment I:a" etc. and any plots requested.
- A complete set of Matlab-files. Choose the most complete version of your code for each assignment. This should be files with everything required to run a simulation, not excerpts to show implementation of specific details.
- It must be shown explicitly what data is used in what way. All calculations must be shown explicitly so that correctness and relation to your dataset can be assessed at a glance.
- When derivations are requested, quantities must be defined in figures. For derivations of equations of motion, free body diagrams must be included.
- The system (ode or dae) actually implemented must be given in the report and be in the order actually implemented, written in a single frame containing *only* the ode or dae implemented and *nothing* else, on human readable form (not Matlab code or pseudocode), and not copied from another document.
- The report must contain sufficient text and illustrations such that it is possible to understand without ever having seen the lab-PM.
- No copies of text, illustrations, equations or code from any other document is allowed (unless it is a document you have created yourself). As an exception, copies of illustrations in the lab-PM defining the problem at hand are accepted.