SYLLABUS

Space flight attitude dynamics 7.5 credits R7016R

Dynamik för rymdfärder:Attityddynamik

Course syllabus admitted: Autumn 2017 Sp 1 - Present

DECISION DATE
2017-02-15

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LULEÅ TEKNISKA UNIVERSITET

Space flight attitude dynamics 7.5 credits R7016R

Dynamik för rymdfärder:Attityddynamik

Second cycle, R7016R

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Rymdteknik	Space Technology

Entry requirements

M0032M Functions of Several Variables and Computer Tools or in other words basic courses in linear algebra, calculus, and ordinary differential equations and partial differentials. In-depth studies in mechanics involving Kepler laws with 3-dim applications, like F0008T Mechanics II and R7015R Space Flight Dynamics: Orbital Dynamics. Some knowledge about satellites as well as some familarity with programming are advantageuos.

Selection

The selection is based on 30-285 credits

Examiner

Johnny Ejemalm

Course Aim

The student shall have ability to understand and predict how spacecraft attitude evolves. The student should be familiar with and be able to describe concepts and methods used within the field spaceflight attitude dynamics and control.

The student shall have capability of performing analytical and computer based calculation of attitude dynamics and control. The student shall have skills in writing report of analysis and calculations.

The student shall be able to assess and report on the feasibility of different attitude control systems in different situations.

Contents

Kinematics and dynamics for 6 degrees of freedom rigid body motion.
Euler angles, Euler equations and quaternions.
Torque free motion, spin stabilization, dual spin, gyroscopic control and gravity gradiant stabilization. Active attitude control.
Linear system calculus, Laplace transforms and transfer functions.
MATLAB simulations.

Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.
Lectures.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.
Written examination and hand in assignments. In order to pass the course it is required that all examinations and obligatory tasks are completely satisfactory. The final grade 5, 4, 3, and U (Fail) given for the course reflects the results obtained in the various components of the course.

Remarks

This course is a prerequisite for the course R7019 Spacecraft Subsystems. This course cannot be part of the degree together with the course R7010R.

Overlap

The course R7016R is equal to R7010R

Literature. Valid from Spring 2015 Sp 3

Sidi, Marcel J., Spacecraft Dynamics & Control. A Practical Engineering Approach, Cambridge University Press 1997.
ISBN-13 978-0-521-55072-7 hardback
ISBN-10 0-521-55072-6 hardback
ISBN-13 978-0-521-78780-2 paperback
ISBN-10 0-521-78780-7 paperback

Supplementary course literature:
Chapter 19 in
Wertz, James R., Everett, David. F., Puschell, Jeffery J.: Space Mission Engineering: The New SMAD, Microcosm Press2011.
ISBN 978-1-881-883-15-9 (pb)
ISBN 978-1-881-883-16-6 (hb)

Course offered by

Department of Computer Science, Electrical and Space Engineering

Items/credits

Number	Type	Credits	Grade
0001	Written exam	4.5	G U 3 4 5
0002	Home assignments	3	U G#

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

Last revised

by Jonny Johansson, HUL SRT 2017-02-15

Syllabus established

by Department of Space Science 2010-02-19