SYLLABUS

Space flight orbit dynamics 7.5 credits R7015R

Dynamik för rymdfärder:Bandynamik

Course syllabus admitted: Autumn 2017 Sp 1 - Present

DECISION DATE
2017-02-15

Luleå University of Technology 971 87 Luleå, Sweden
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LULEÅ TEKNISKA UNIVERSITET

Space flight orbit dynamics 7.5 credits R7015R

Dynamik för rymdfärder:Bandynamik

Second cycle, R7015R

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. Some knowledge about satellites as well as some familarity with programming are advantageous.

Selection

The selection is based on 30-285 credits

Examiner

Johnny Ejemalm

Course Aim

The student shall acquire ability to understand and predict how spacecraft orbit evolves.
The student shall acquire familiarity with concepts and methods used within the field spaceflight dynamics. These requirements are shown by the student’s ability to account for this.

The student shall acquire capability of performing analytical and computer based calculation of orbits. The student shall acquire skills in writing report of analysis and calculations.

The student shall be able to value different orbits efficiency concerning time consumption and fuel consumption. This is shown by comparative calculations.

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epokUtils.htmlFieldProcessResult('_htmlField_952975544',''); }); epokLayout.unsubscribe(this);

Contents

Kepler’s equations and Kepler’s problem. Classical orbital elements. Time and reference systems. Transformation between different reference systems.
Undisturbed elliptic, hyperbolic, and parabolic orbit.
Orbital maneuvers and transfers.
Orbit determination: Lambert’s problem.
Orbit perturbations: Flattening and irregularities of the Earth, third-body perturbation, atmospheric drag force, and solar-radiation pressure.

Realization

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

Lectures. Students solve certain exercises with computer aids.

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.

Literature. Valid from Spring 2015 Sp 3

Vallado, David A., Fundamentals of Astrodynamics and Applications, 3rd ed. Series: Space Technology Library, Vol 21, Springer 2007.
Hard, ISBN 10: 0387718311 ISBN 13: 9780387718316
Microcosm: Soft. ISBN-10: 1881883140 ISBN-13: 9781881883142

Supplementary course literature:
Chapter 9 and 10 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
0002	Written exam	4.5	G U 3 4 5
0004	Assingment work	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 2009-12-17