Study programmes: Computer Science - Master academic studies

Course name: Space mission design

Lecturers: Dušan Marčeta

Status: Optional

ECTS: 8

Attendance prerequisite: No prerequisite classes

Course aims: To gain the elementary knowledge of astrodynamics and specific knowledge of movement of artificial satellites and interplanetary probes.

Course outcome: By the end of the course, student has the essential knowledge of celestial mechanics used in specific problems of movement of artificial satellites, as well as the movement of interplanetary probes. The student understands all the relevant terminology: planetocentric orbit, heliocentric orbit, transfer orbit, circular velocity, parabolic velocity. The student is trained to use knowledge from computing in solving some of the dynamic problems of interplanetary flight numerically.

Course content:

Theoretical basic. Coordinate systems and time measuring systems used in astrodynamics, the potential of the gravitational field, the characteristics of the cones section, the problem of two bodies, Kepler's problem, the problem of three bodies

Artificial satellites. The satellite orbiting equation, the satellite speed at orbit, characteristic orbits of artificial satellites (low, medium, high, geosynchronous, heliosynchronous, ...), transfers between orbits.

Interplanetary flight. Interplanetary transfer, Lambert's problem, transfers types, launch windows, specificity of interplanetary transfers to the planets of the solar system.

Computer use in astrodynamics. Use of the python language for solving specific problems of astrodynamics, primarily related to determination of interplanetary trajectories as well as transfer problems between planetocentric orbits.

Literature:

Miroslav Nenadović, Osnovi kosmičkog leta, Belgrade, 1979.

Jovan Lazović, Osnovi teorije kretanja Zemljinih veštačkih satelita, Belgrade, 1976.

Literature for exercises:

Stephen Kemble, Interplanetary Mission Analysis and Design, Springer, 2006.

Number of classes of active teaching: 3	**Theoretical classes per week: 2**	**Lab and practical work per week:** 2

Teaching and learning methods: Lectures and exercises

Assessment (maximal 100 points)

Course assignments	points	Final exam	points
Lectures		Written exam	40
Exercises / Tutorials		Oral exam	40
Colloquia	10	Written-oral exam	
Essay / Project	10	Written exam	