

Faculty	Faculty 5: Nature and Engineering
Course Title	Orbital Mechanics
Number of ECTS credits	6
Hours per week (SWS)	4 + 8
Required Semester	3 rd year students from exchange partners (upon request and check) and Master students
Time	Fall semesters
Course objective	<i>Students learn to use the orbital mechanics basics to calculate space missions of spacecrafts with special emphasis on the required systems. They are able to calculate near earth, moon and interplanetary orbital missions within our solar system under strict regard of the system requirements and the feasibility limits.</i>
Prerequisites	Experience with aerospace basics: math, physics, thermodynamics
Recommended reading	Will be given before the lectures.
Teaching methods	Seminars and self-study
Assessment methods	Examination according to examination regulations
Language of instruction	English
Name of lecturer	Prof. Dr.-Ing. Bernd Steckemetz
Email	Bernd.Steckemetz@hs-bremen.de
Link	http://www.fbm.hs-bremen.de/modul/beschreibung.aspx?modul_id=6cf2cdf6-7bc3-4060-abc7-62afc6155ebc
Course content	<ol style="list-style-type: none"> 1. <i>Introduction</i> <ul style="list-style-type: none"> ○ <i>Historical Review of Orbital Mechanics</i> ○ <i>Actual Spacecraft Mission Design Application</i> 2. <i>Two-Body Motion</i> <ul style="list-style-type: none"> ○ <i>Circular Orbits</i> ○ <i>General Solution</i> ○ <i>Elliptical Orbits</i> ○ <i>Parabolic Orbits</i> ○ <i>Hyperbolic Orbits</i> ○ <i>Time Systems</i> ○ <i>Coordinate Systems</i> ○ <i>Orbital Elements</i> 3. <i>Orbital Maneuvers</i> <ul style="list-style-type: none"> ○ <i>In-Plane Orbit Changes</i> ○ <i>Hohmann Transfer</i> ○ <i>Bielliptical Transfer</i> ○ <i>Plane Changes</i> ○ <i>Combined Maneuvers</i> ○ <i>Propulsion for Maneuvers</i> 4. <i>Observing the Central Body</i>

	<ul style="list-style-type: none">○ <i>Effect of the Launch Site</i>○ <i>Orbit Perturbations</i>○ <i>Ground Track</i>○ <i>Spacecraft Horizon</i>5. <i>Special Earth Orbits</i><ul style="list-style-type: none">○ <i>Geosynchronous Orbit</i>○ <i>Sun-Synchronous Orbit</i>○ <i>Molniya Orbit</i>○ <i>Low Earth Orbit</i>6. <i>Interplanetary Missions</i><ul style="list-style-type: none">○ <i>Patched Conic Approximation</i>○ <i>Highly Simplified Example</i>○ <i>Patched Conic Procedure</i>○ <i>Locating the Planets</i>○ <i>Design of the Transfer Ellipse</i>○ <i>Design of the Departure Trajectory</i>○ <i>Design of the Arrival Trajectory</i>○ <i>Gravity-Assist Maneuver</i>○ <i>Establishing a Planetary Orbit</i>7. <i>Lunar Trajectories</i><ul style="list-style-type: none">○ <i>Motion of the Earth-Moon System</i>○ <i>Time of Flight and Injection Velocity</i>○ <i>Sphere of Influence</i>○ <i>Lunar Patched Conic</i>
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