Space Geodesy - BMEEOAFDT82

I. Subject Specification

1. Basic Data

1.1 Title

SATELLITE GEODESY

1.2 Code

BMEEOAFDT82

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	2

1.5 Evaluation

Exam

1.6 Credits

3

1.7 Coordinator

name	József Ádám
academic rank	Professor emeritus
email	adam.jozsef@emk.bme.hu

1.8 Department

Department of Geodesy and Surveying

1.9 Website

https://epito.bme.hu/BMEEOAFDT82
https://edu.epito.bme.hu/course/view.php?id=4920

1.10 Language of instruction

hungarian

1.11 Curriculum requirements

Optional in the Land Surveying and Geoinformatics (MSc) programme

1.12 Prerequisites

1.13 Effective date

1 September 2022

Space Geodesy - BMEEOAFDT82

2. Objectives and learning outcomes

2.1 Objectives

Goal of the subject is that the student be familiar with methods of space geodesy and their fields of application. Knowledge acquired during this course should enable the student to understand and apply main methods that can be found in research papers in his field. Practical examples help the application of the various methods studied.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1.

B. Skills

1.

C. Attitudes

1.

D. Autonomy and Responsibility

1.

2.3 Methods

lectures

2.4 Course outline

Week	Topics of lectures and/or exercise classes
1.	Task and division of space geodesy. The structure of the universe. The Solar System. The Earth and its movements.
2.	The Earth-Moon system. The apparent motion of celestial bodies. Celestial coordinate systems. The horizon coordinate system.
3.	Star catalogues, yearbooks. Calculation of stellar coordinates. Earth reference systems. Relationship between celestial and terrestrial coordinate systems.
4.	Time systems.
5.	Time measurement needs. Clocks and frequency standards, measurement of time. Signal propagation.
6.	Basics of astrogeodetic measurements. Determination of astronomic latitude. Determination of astronomic longitude and azimuth
7.	Geodetic artificial satellites. The motion and orbit of satellites in the Earth's gravity field.
8.	Calculation of the position of an artificial satellite. Calculation of the topocentric position vector of a satellite. Observation methods and techniques. Photographic observations.
9.	Telemetry methods. Doppler measurement method.
10.	Global positioning systems (GPS, GLONASS). Calculation of the geocentric position vector of a GPS satellite from on-board orbital elements.
11.	Satellite altimetry. Satellite to satellite tracking. Satellite gravity gradiometry.
12.	Interferometric measurement of radio sources. Space

	VLBI.
13.	Geodetic applications of satellite geodesy methods. Geometric and dynamic satellite geodesy.
14.	Geodetic and geodynamic applications of VLBI.

The above programme is tentative and subject to changes due to calendar variations and other reasons specific to the actual semester. Consult the effective detailed course schedule of the course on the subject website.

2.5 Study materials

- Seeber, G. : Satellite Geodesy, Berlin, New York: De Gruyter, 2008.
- Curtis, H.: Orbital Mechanics For Engineering Students 4th Edition, Butterworth-Heinemann, 2020
- Nothnagel, A.: Elements of Geodetic and Astrometric Very Long Baseline Interferometry, 2021. https://www.vlbi.at/data/publications/2021_Nothnagel_Elements_of_VLBI_20210309.pdf
- Adam, Jozsef, Estimability of Geodetic Parameters from Space VLBI Observables, NASA Goddard Space Flight Center, Greenbelt, MD, NASA Grant No. NSG 5265, OSURF Proj. No. 711055, 101 pp, July 1990. OSU Report No. 406.

2.6 Other information

2.7 Consultation

This Subject Datasheet is valid for:

2025/2026 semester I

II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
exam	E	

The dates of deadlines of assignments/homework can be found in the detailed course schedule on the subject's website.

3.3 Evaluation system

Abbreviation	Score
E	100%
Sum	**100%**

3.4 Requirements and validity of signature

3.5 Grading system

Grade	Points (P)
excellent (5)	80<=P
good (4)	70<=P<80%
satisfactory (3)	60<=P<70%
passed (2)	50<=P<60%
failed (1)	P<50%

3.6 Retake and repeat

3.7 Estimated workload

Activity	Hours/semester
contact hours	14×2=28
preparation for the exam	62
Sum	**90**

3.8 Effective date

1 September 2022

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2025/2026 semester I