Integrated Sensor Systems in Geodesy and Surveying - BMEEOAFDT83

I. Subject Specification

1. Basic Data

1.1 Title

Integrated Sensor Systems in Geodesy and Surveying

1.2 Code

BMEEOAFDT83

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	Dr. Takács Bence
academic rank	Associate professor
email	takacs.bence@emk.bme.hu

1.8 Department

Department of Geodesy and Surveying

1.9 Website

https://epito.bme.hu/BMEEOAFDT83
https://fiek2.mywire.org/course/view.php?id=3548

1.10 Language of instruction

english

1.11 Curriculum requirements

Ph.D.

1.12 Prerequisites

1.13 Effective date

1 September 2022

2. Objectives and learning outcomes

2.1 Objectives

In the frame of the course, students learn the mathematical, physical and algorithmic basis of applying different sensors in the field of geodesy, land surveying, geoinformatics and navigation. Students take measurements using a wide variety of sensors and develop the programs to evaluate the measurement results in teamwork.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. has an overview of sensors used in geodesy, land surveying, geoinformatics and navigation
2. understands the basics of algorithms applied for sensor fusion in the previous fields
3. knows the different communication channels, protocols to communicate sensors

B. Skills

1. uses and adjusts existing matlab or python codes to evalute the measurements of sensors in geodesy, land surveying, geoinformatics and navigation.
2. is able to make cable or cordless connection to sensor and test the connection

C. Attitudes

1. is open to sharing the developed algorithms in GitHub repositories.
2. prepares enough comments in the code and commit messages for making the developments understandable for research fellows.

D. Autonomy and Responsibility

1. In some situations - as part of a team - collaborates with other students in solving tasks.

2.3 Methods

Lectures, individual projects with consultation. Presentation of an individual project.

2.4 Course outline

Week	Topics of lectures and/or exercise classes
1.	Coordinate frames, reference systems
2.	Kalman Filter-Based Estimation
3.	Inertial Sensors
4.	Inertial Navigation
5.	Dead Reckoning, Attitude, and Height Measurement
6.	Principles of Radio Positioning
7.	Global Navigation Satellite Systems, Fundamentals
8.	GNSS: Advanced Techniques
9.	INS/GNSS Integration
10.	INS Alignment, Zero Updates, and Motion Constraints
11.	Multisensor Integrated Navigation
12.	Fault Detection, Integrity Monitoring, and Testing
13.	Applications and Future Trends
14.	Summary. Individual student project demonstrations.

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

1. B. Hofmann-Wellenhof, K. Legat, M. Wieser: Navigation. Springer Science & Business Media, 2003
2. P.D. Groves (2004): Principles of GNSS, Inertial and Multisensor Integrated Navigation Systems. Artech House Publishing.

2.6 Other information

2.7 Consultation

Appointments: As specified on the department's website, or in consultation with the course instructors via e-mail

This Subject Datasheet is valid for:

Nem induló tárgyak

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	A.1-A.3
individual project	IP	B.1-B.2; C.1-C.2; D.1

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	60
IP	40
Sum	**100%**

3.4 Requirements and validity of signature

submission of the individual project and acceptance by the course coordinator

3.5 Grading system

The final grade is the weighted average of the evaluations according to the clause 3.3.

3.6 Retake and repeat

1. Individual project can be submitted after its deadline specified in the detailed course programme until 11:59 pm on the last day of the completion week. In this case, the student must pay the pre-determined fee.
2. Submitted and accepted home works can be corrected until the deadline given in point 1) without paying a fee.

3.7 Estimated workload

Activity	Hours/semester
Contact hours	14×2=28
Preparation of the individual project	32
Preparation for the exam	30
Sum	**90**

3.8 Effective date

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