Module: Localization

Module code	**TA.LOC**							
Module type	❑ Core ☒ Related ❑ Project ❑ Minor							
Module level	❑ Basic ❑ Intermediate ☒ Advanced							
ECTS-Credits / Points	☒ 3 ❑ 6 ❑ 12							
Bachelor degree course	Archi-tecture	Interior design	Building technolo-gies	Civil engineering	Electrical engineering	Computer Science	Mechanical engineering	Business engineering/ Innovation
Compulsory **X** / optional **(X)**					**(X)**	**(X)**	**(X)**	**(X)**
Module responsible	Zeno Stössel, 041 349 3390, zeno.stoessel@bluewin.ch							
Execution	☒ Semester ❑ Intensive week ❑ Fall ☒ Spring							
Language	❑ German ☒ English							
Required entry Competencies	Experience with Matlab/Simulink; experience in stochastics; programming experience with Visual Studio using C# or C++, English CEF level of B2 or equivalent or higher							
Admission Conditions and mode of the competency confirmation	Admission Conditions: accepted reports on practical work competency confirmation: individual oral examination							

Competencies to achieve	Operational learning goals concerning:
Professional Competencies	F1: The student can cite the most relevant outdoor and indoor localization and navigation technologies. F2: The student knows different sensors and algorithms typical for localization and is able to integrate them into a system. F3: The students can apply the Kalman filter to reduce the measurement error of real data in the context of multi-sensor fusion problems. F4: The students can apply methods to solve the camera pose estimation problem as well as approaches for image retrieval using Bag of visual Word.
Methodological Competencies	M1: The student can implement a simple localization and navigation system step by step in an engineering fashion. M2: The student has the ability to research and apply technical articles in the domain of localization and navigation.
Personal Competencies (Social Competencies)	P1: The student can identify his own knowledge gaps and fill them with self-studies. P2: The student can use team work for problem solving. P3: The student is able to describe complex real world problems with theoretical models and optimize the model parameters through comparison with measured data.

Literature / Teaching Material	Literature: Indoor Positioning Technologies, Habilitation Thesis, Dr. Rainer Mautz, Feb 2012; "Aerospace Sensor Systems and Applications" (Shmuel Merhav) und "Global Positioning System & Inertial Navigation" (Jay A. Farrell & Matthew Barth) Teaching material will be available on the chosen internet platform. A variety experiments will be available, with materials, measuring equipment and short description.
Supporting and deepening module	-
Remarks	-

Short description of Module	In this course you will learn how persons and things can be localized and navigated outdoors and indoors. Which sensors and algorithms are used to find a position and how one can navigate in an environment? Localization and navigation with GPS, WLAN, vision based technologies and inertial systems are studied in details. Theoretical aspects will be lectured by aims of eLearning. In this course experiments are important. Setups of experiments are ready and they are accompanied by our lecturers.

Changing history:

Index:	Date:	Text:	Visum:
01	31.05.2013	Basic Document for first implementation	Stz
02	12.06.2013	Clarifications and corrections	Stz

-	19.06.2013	Examination date	
-	19.06.2013	Release date	Mub

Diary module header (module course)

term (TE) 1	TE 2	TE 3	TE 4	TE 5	TE 6	TE 7
Introduction and Rules of course. Overview on **localization and navigation** (L&N).	Overview on L&N and exercises	Q&A: Overview on L&N and exercises			Introduction into L&N with WLAN. Introduction to practical work and assignment to team.	Practical work on L&N with vision.
		Introduction into L&N with vision. Introduction to practical work and assignment to team.	Practical work on L&N with vision.	Practical work on L&N with vision.	Presentation and discussion of practical work. Q&A: L&N with vision	
Classroom	ASS	classroom	AS & ASS	AS & ASS	classroom	AS & ASS

TE 8	TE 9	TE 10	TE 11	TE 12	TE 13	TE 14
Practical work on L&N with vision.	Presentation and discussion of practical work. Q&A: L&N with WLAN					Q&A: regarding exercises and final examination.
	Introduction into L&N with inertial sensors. Introduction to practical work and assignment to team.	Practical work on L&N with inertial sensors.	Introduction signal analysis and data fusion. Introduction to practical work. Q&A: L&N with inertial sensors.	Practical work on L&N with inertial sensors and data fusion.	Practical work on L&N with inertial sensors and data fusion.	Presentation and discussion of practical work. Q&A: L&N with data fusion,
AS & ASS	Classroom	AS & ASS	classroom	AS & ASS	AS & ASS	classroom

AS: accompanied study, laboratory work; ASS: accompanied self-study with wiki and/or blog; SS: self-study

Reference for the diary:
- No names of lecturers are needed.
- Each term content a course description, a key content and the teaching method as well as the learning modalities (2-3 key points, no detailed index).
- If the teaching methods (AS. ASS und SS) are used, do not delete the footer.