Activity Report

General objective.

In the period from 12.10.2021 to 8.2.2022, Dr. Michael Mayer as lecturer at the Karlsruhe Institute of Technology (KIT) and Dr. Jaime Freiberger Jr as lecturer at the Federal University of Santa Maria (UFSM, Brazil) jointly reviewed the teaching-learning configurations in their universities. Educational trend analyzes were carried out under consideration of the prominent changes due to the COVID-19 pandemic in particular. Based on that, joint future teaching projects/exchange was planned.

Preparation of the work environment / protocols.

The Geodetic Institute of KIT (GIK/KIT) provided an office for Dr. Jaime. An email account has been created on the KIT server for access to the KIT network. The first meetings were face-to-face to discuss COVID-19 prevention guidelines and vaccination certification according to German protocols. In addition, Dr. Mayer explained the resources currently used for remote meetings, data storage and digital information exchange (e.g., MS Teams software for sharing data, files and holding meetings and video calls. With respect to teaching, he explained how ILIAS is used at GIK/KIT for example. Dr. Jaime was included as an active participant in the weekly meeting of the Working Group *Geodetic Earth System Sciences* (GESS), led by Prof. Kutterer, where presentations of scientific work, discussions and general communications are held. At the February 2nd 2022, Dr. Mayer and Dr. Jaime gave a presentation on the recent status of the cooperation and discussed future plans with the GESS working group.

Sharing experiences and knowledge.

At the various meetings, Dr. Mayer made available a set of materials used in his classes of the lecture *Positionsbestimmung mit GNSS*. These materials consist of transparencies, video lessons, technical brochures of his authorship, technical standards (DIN), worksheets of field practices, among others. He explained his teaching method and teaching attitude and how his students carry out field practices. Data tables that students must present as a mandatory task of the lecture were analyzed. Dr. Mayer introduced the digital tools he uses in classes and exams. He recommended a program for videoconferences and synchronous classes, also a detailed search on collaborative tools for future application in UFSM classes besides several publications. Dr. Mayer brought into discussion the "Flipped Classroom" and "Peer Instruction" learning methods. According to him, these teaching strategies can provide efficient results to remote teaching combined with traditional teaching techniques. Likewise, Dr. Jaime presented his teaching experiences at UFSM. He emphasized his teaching methods and how the loads of practical and theoretical classes are distributed, which instruments are used in his practical classes, labor conditions, procedures for carrying out class operations and evaluation criteria. They discussed how they could implement learning methods in UFSM classes. In addition, joint teaching projects were planned to increase interdisciplinarity at UFSM and KIT.

On the research topic.

Several meetings were conducted by Dr. Mayer, starting with a diagnosis of the current educational structure of the two universities to understand the feasibility of teaching joint classes. The following topics were treated: courses and subjects, number of students, workload, beginning and end of the semesters, teaching methods (how theoretical content is taught and how practical activities are carried out), GNSS processing programs and how field practices are carried out, and the status of the KIT's and UFSM's educational structure to enable remote classes in English. There was a discussion about mandatory and complementary subjects that can – from the students' perspective – offer interesting content for the exchange. The class settings and materials such as slides, videos recorded during the pandemic, as well the class settings of other UFSM lecturers were analyzed. Some advantages of asynchronous classes were highlighted, such as more time for students to formulate questions and for lecturers to build answers and explanations. Likewise, the advantages of face-to-face classes were highlighted. The pedagogical tools used during the C-19 and the settings, that each lecturer implemented in their classes were identified. The evaluation methods were discussed, also the problems to run exams, which were in person and individual, and started to be carried out remotely. Among the field practices carried out at GIK/KIT and UFSM, the absolute GNSS-based positioning method was under the focus of discussion. By this method, students perform geodetic measurements through smartphone applications. The characteristics of the practical exercise were discussed in detail, concluding that there are synergetic differences in the way teaching/learning is carried out. Thus, the absolute GNSS-based positioning method was chosen as a form of joint classes, where students will carry out a field practice in their respective academic environments, analyze the data, prepare reports, and present the results in videos resp. joint online classes.

Perspectives.

Staring in summer term 2022, there will be joint teaching elements at UFSM and KIT (recent status: asynchronous, video-based). Based on the evaluation of the performance and the gained experiences, subject-related modifications will be considered, to increase the level of joint teaching in the future, e.g., focusing on RTK resp. NRTK approaches. Further benefits are expected regarding improved teaching procedures, increased students' involvement, application of discernment, and self-awareness. In addition, it is planned to involve other UFSM lecturers in this cooperation. Therefore, an online presentation is planned for March at UFSM. The findings of this joint teaching approach will be presented in a peer-reviewed scientific paper (e.g., FIG 2023, dghd2023), to share the contribution of this collaboration in the context of acquisition of GNSS-related and intercultural competencies with a special focus on internationalization of UFSM and KIT.

Karlsruhe / Santa Maria, 24.02.2022. Michael Mayer / Jaime Freiberger Jr.