

Description of the IFI / IFI-dual program

Since the year 2000 the International Women's Degree Program in Computer Science (IFI) has been working on the recruitment and successful retainment of young women in a bachelor's study program in computer science. The program is strictly single-sex during the first 3 semesters. The program emphasizes an interactive teaching approach and offers best individual support by professors, tutors and IT experts from companies. In more detail the study program is organized as follows:

Curriculum

The curriculum corresponds to the standard education in applied computer science as recommended by the German Informatics Society. This includes standard topics (like programming, operating systems, databases, software engineering, human computer interaction, networks) as well as project work in a variety of application areas. Electives (like data science, robotics, testing, linux academy) provide the opportunity to define an individual focus. Only very few (female) students know the hardware of their own computers or are curious about it. Nevertheless, this knowledge raises confidence in one's personal technical competences. Therefore, an explicit module on hardware is added during the first term where students learn to add and to remove hardware components, to install a new operating system and to configure their own network. This class ends with an installation party to get running all the software needed during the first year. This module is quite trivial for some students, but there is a significant number of students who need this class to become comfortable with all aspects of their own technical equipment.

Our students will be exposed as female IT experts in profession and in their private life. They like to have a broader perspective on IT, and the program supports this ambition. The curriculum includes a class on the implications of IT on society, where we invite experts for current topics and encourage discussions and the personal reflected positioning.

Teaching

In Germany the ratio of female computer science students varies between 10% (in technical computer science programs) and 20% (in business informatics or media informatics). So, in any computer science class the female students build a minority. Minorities (anywhere) are subject to unspoken (and unintended) restrictive rules for participation. Especially female students have a lower technical self-esteem and tend to retain their contributions in a mixed class. Therefore, all classes during the first three terms are strictly single-sex. Per year 36 students are accepted to the IFI program. All teaching people know all students with their names – and all students are addressed personally in class with questions and direct invitations to present solutions or other contributions to the problems discussed. The program emphasizes that no prior knowledge in computer science is required. In this setting no one can compromise herself as being “the girl who doesn't know”.

In the labs the class is split into two groups to guarantee best individual progress in the concrete work with software or hardware. All classes and labs are supported by student tutors. The grading is based on continuous exercises during the teaching weeks and on final exams.

Students and professors

Universities of Applied Sciences like Hochschule Bremen usually attract students from the local area (Bremen and around). Typical students are the first academics in their family who prefer to live at home during their first years and who only gradually leave their well-known surroundings.

In contrast the IFI program attracts students from all over Germany and abroad. The IFI students build a very diverse group according to age, social status, family situation and cultural background.

Professors and teaching staff for the IFI program are selected according to the standard procedure at German Universities thus ensuring the same level of academic qualification. During the application procedure a special emphasis on the applicant's interest and engagement in teaching is taken.

International exchange

The IFI program is an international one with a mandatory term spent abroad in the third year. Hochschule Bremen as well as the Department of Electrical Engineering and Computer Science and the IFI program hold more than 360 international cooperations with partner institutions (all over Europe, in Jordan, in India, in the US and Canada). The exchange is financially supported by European funding (Erasmus) that compensates for necessary extra expenses. The students get help in organisational issues from our International Office caring for housing and funding. The professors help with the selection of classes to be taken abroad. This agreement is fixed in a learning agreement of all parties (student – home university – partner university). In exchange students from abroad join the higher IFI classes. As well professors from partner universities contribute to electives.

The international exchange is depicted to be important for most IFI students who appreciate to gain international experience in this comfortable setting.

Dual program option

Since 2016 the IFI program has been complemented by a dual program option. In the dual program option students are not only students of Hochschule Bremen, but as well they are employees of partner companies and institutions. Right from the start they receive a basic salary. They are introduced to their partner institution through a series of internships where they work in regular teams and contribute by what they have learned so far at the Hochschule. Thus, they directly experience the use and practical application of their knowledge. Vice versa they contribute with their practical experience to the classes and labs of the forthcoming semesters.

Partner institutions are involved in teaching in the IFI program. They may offer topics for joint projects at the Hochschule. Our dual students write their bachelor's thesis in cooperation between the academic and the practical world. After successful graduation the students are offered a permanent employment.

In the dual program the partner companies get to know their future IT experts right from the start. By cooperating with IFI-dual the companies can be confident of the diversity in their IT teams.

Soft factors

The program pays serious attention to several soft factors for students' success: Students from the same year get to know each other really well through interactive teaching and learning and through teamwork. Students from different years get to know each other through tutors and support in the labs by elder students. Homecoming students from their term abroad offer an international fair where they present the experiences made (on the foreign university, on computer science there, on food and music and friends ...) to the outgoing of the next year. A number of get-together-meetings (like the Christmas party for all students and professors, a summer barbecue at the end of the term) help to develop a more casual and relaxed communication style. Alumni are invited to these events as well. They provide information and experiences about their way so far and they can open the doors to future internships or employments.

Summary

All these components help to attract young women to a high-level education in IT and to retain them with a solid career option.

The IFI program's impact

Single-sex study programs are definitely unusual in Germany. IFI as a single-sex study program in computer science always has to fight the prejudice to offer an unrealistic and too easy-going entrance to IT. Therefore, the program pays significant attention to high-quality standards in education and to the evidence of the program's impact on female success in IT.

The IFI program was established in the year 2000 as a model project funded by the German government, Ministry of Education. During the first five years the program was continuously supervised and evaluated. In 2005 the first generation of IFI students had successfully graduated and positioned themselves in IT companies or in a continuing academic career. In answer to the impact proved so far, the IFI program turned to a permanent regular study program as part of the Department of Electrical Engineering and Computer Science at Hochschule Bremen.

The program's impact on female success in IT can best be demonstrated in the categories: students – diversity - international cooperations – dual cooperations with IT companies – political impact.

Students

IFI and IFI-dual offer 36 university places, 10 of them in the IFI-dual program. The ratio of female students in the Department of Electrical Engineering and Computer Science has raised from less than 15% to more than 20% (in 2020). This change is obvious in classes like the electives that are offered in a coeducative setting. But as well the atmosphere in common places like the mensa has changed significantly during the progress of IFI. As well the presence and influence of female student representatives in committees (in the board of the faculty or for the selection of new professors) has grown.

For years constantly two of our students have managed to receive a stipend (DAAD or Deutschland-stipendium).

Female student tutors play an important role for orientation and guidance of younger students. They are as well active in school cooperations (in our "young IT lab") and in information fairs for girls.

Our graduates are spread in a variety of IT companies and in academics. One of our alumni has attained a permanent professorship at the University Oldenburg. Others start their own business.

Diversity

The IFI and IFI-dual students constitute one of the most diverse groups at Hochschule Bremen.

The age of our students ranges from 18 years (those who just have left school) to about 45 years (those who attempt a new start after years in a different profession or with a young family).

The family status of our students corresponds to this variety: Some students are still living at home with their parents, others just have left their original home and have moved to a shared apartment, others are living with their partner and kids, the next ones have left all this and start again.

Some students study in part-time because of various responsibilities.

To give an impression of our students' multicultural background let's have a deeper look at the starters from 2020: Two come from Africa, two from Middle America, one from Syria, four have a migrant Turkish background, one comes from Hongkong. This variety has proved to be typical for IFI classes, though the concrete home countries vary.

The students' motivation to join the IFI program is manifold as well: Intermediate learners with some practical on-the-job training meet with students without any prior IT knowledge. Some have good reasons for our ambitious study program because they have had experiences with less challenging and less profitable (classical female) positions before - in the social sector or as a shop assistant. In these positions they often had to spend their time using IT without understanding it (for book-

keeping, for statistics). Now they want to design and construct IT in their way. Some directly claim that they aim at a position with a good salary that offers the choice among different career options corresponding to their changing needs.

International cooperations

IFI and IFI-dual hold more than 360 international cooperations: on the level of the university, on the level of the department or on the level of specific study programs. One of them is Tsuda University, Tokyo, a women's university in Japan. Some of these cooperations could be established because the partner institutions focus on support of female students or because international lecturers like to contribute to our program with its familiar and ambitious setting.

Dual cooperations

Currently IFI-dual cooperates with six partner institutions. All of them are seriously interested in improving the diversity of their IT teams. The dual cooperations include internships, joint projects and guest lectures by experts from the dual partners. Dual students write their thesis in cooperation between the partner institution and the Hochschule. Since 2016 more than 30 young women have started in the IFI-dual program. The first five of them have graduated and have started their professional career in the partner institution.

The German Armed Forces belong to our dual partners. The class on the implications of IT on society (with topics including predictive policing, human-computer-interaction in production or warfare, affirmative robotics) has proved to prepare for the forthcoming responsibilities of our dual students.

Political impact

Study programs are evaluated continuously in Germany (as part of the Bologna agreements). IFI and IFI-dual have passed the last quality control in spring 2021 successfully. The structure of IFI-dual (with its mix of internships and theoretical phases at the Hochschule, with its international term spent abroad and with the final term spent completely at the partner institution) now serves as the standard model for our whole department. The structure is currently adopted by new dual programs in media informatics and in technical computer science.

The department is about to establish a new study program on data science. The study program is coeducative, but it is designed with the explicit intention to attract female students as well. The new program takes over some kernel curricular attributes of IFI. Especially our focus on projects and practical applications in close cooperation with companies is adopted, as well as a class on the implications on society.

In Germany IFI is known for its success in the recruitment of young women for IT. Inspired by IFI another single-sex study program in computer science has been established in 2010 at HTW Berlin. The program is not international and offers no dual option, but it adopts the IFI ideas about interactive teaching and learning, the absence of prerequisites and the application-orientation in the classes.

Summary

IFI and IFI-dual attract a definitely diverse group of female students. The program manages to encourage female students to an academic IT education and provides the opportunity for a guided (in the dual option) or a self-made (in the non-dual option) career. The program's main impact is the encouragement of young women to get involved in IT and to make their own way.

IFI + IFI-dual: Reference list

- [1] Hochschule Bremen: <https://www.hs-bremen.de/internet/en/index.html>
- [2] IFI: <https://www.hs-bremen.de/internet/en/studium/stg/ifi/index.html>
- [3] IFI-dual <https://www.hs-bremen.de/internet/de/studium/stg/ifi-dual/index.html>
- [4] start_up_talks <https://www.hs-bremen.de/internet/de/forschung/gruendung-transfer/existenz/gruendung-talk/>
- [5] Internationality <https://www.hs-bremen.de/internet/en/international/>
- [6] Alumni <https://uol.de/des/team/astrid-niesse>
- [7] Dual studies https://www.hs-bremen.de/mam/hsb/flyer/hsb_duales_studium_schueler.pdf
- [8] HTW Berlin <https://fiw.htw-berlin.de/>
- [9] Young IT lab <https://www.hs-bremen.de/internet/de/einrichtungen/fakultaeten/f4/forschung/labore/jil/>