Project title: Modularisation: the case of mathematics in/for engineering education

Abstract:

Modularisation of the curriculum is a shift from a time-based to a credit-based structure that caters for the needs of a more diverse student groups. It is also based on the principle of dividing learning into accessible, quantifiable (and measurable) units of knowledge called modules, which students can access when needed (e.g. for projects). [French, 2015].

Modular systems possess prominent features that can be an attractive alternative to those of traditional courses. Flexibility in choice and mobility are the key elements of modularization, and they hold the reason to its current popularity. Due to flexibility and mobility, students can continue their education according to different circumstances or interests. Modular system schemes are actively student-centered, and students can shape their learning trajectories according to their needs, such as proceeding at their own pace and following individual learning paths. Additionally, assuming that not all the students have the same areas of interest and motivation goals, a larger variety of topics are typically introduced. One of the most notable advantage is that students can 'walk through' the module at their own pace, repeat or change the learning mode, which helps students to identify their own weaknesses and strengths, and to achieve to complete the module with a fuller understanding [French, 2015; Ahrens, Blumel & Gersemann, 2001].

According to 2030 vision of TU/e, one of the main aims is to change the curriculum from a course-based ('traditional') engineering curriculum to a challenge based one. Regarding this context, modularization is crucial, as it offers students opportunities for designing their own learning trajectories with respect to their individual needs, interests and aspirations via knowledge bites modules that can be taken 'just in time'.

However, students often do not know on which criteria to base their choice of modules, and how to connect the knowledge from previous modules to present module knowledge, and further on how to make connection to future modules. It is important to be aware of the fact that students need appropriate support to be able to act autonomously in terms of their choice of learning and study trajectories. It is simply not enough to provide them with a large number of modules, but they also need support for the 'orchestration' of the modules, in order to develop a meaningful learning trajectory.

All these aspects necessitate the development of a different 'frame of mind' of all stakeholders (especially for students and instructors), which is often associated with a shift from a teacher-centered to a student-centered mindset. Accordingly, instructors need to design (modules and) modularized courses from a student perspective. This means considering what students' needs, interests, and ambitions are, which modules and modularized courses they might need to fulfil their ambitions, and how to design and arrange the modular courses (and modules) in such a way that makes it easier and more flexible for students to develop (and position themselves in) their chosen learning trajectory.

To this end, one of our project objectives is to develop and validate a framework to support teachers with their modular course design; another to provide supporting tools for students to navigate through a modularized system.