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Emphasizing Soft Skill Learning and Training as part of an Engineering Curriculum Revision

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It is largely recognized that engineers of the future must be able to do more than just perform technical tasks ([1], [3]). The engineer profile has developed from the professional and scientific engineer of the last century to the enterprising engineer ([2]). This must also have an impact to the engineering education. While the new structure will, almost certainly, continue to be based on a solid preparation in mathematics and sciences, it is likely to emphasize the professional role of the engineer, and the demand of soft skills. In this paper we will explain how we tried to introduce soft skills elements into our new revision of the bachelor curriculum in computer science engineering.

There are many reasons why a curriculum must be renewed in its structure. If you take into account a computer sciences engineering curriculum, you will certainly argue that the main need for renewal derives from the continuously evolving technologies, which generates new needs for technical skills in the future engineers. The engineer is daily confronted with many technical disciplines, and needs to be able to interact with peers from other fields. At the same time the importance of the engineer in the society is such that we cannot limit his role to the technical competences. He often holds responsibilities in his work that one should not underestimate. These are the reasons why we tried to consider further skills when redesigning our CS engineering bachelor curriculum during or last renewal process, started two years ago.

We call here soft skills all required skills that are not strictly technical ones or basis mathematical skills, as required during the first semesters. The more visible soft skills are related with the personal communication, but this is only one aspect. Other ones have to do with the ability to work in team, the ability to take decisions, the readiness to adapt to new situations, etc. Interdisciplinary elements are also considered soft skills, even if they are more related to technology aspects, because what we want to train with interdisciplinary courses is not the specific mix of different technical disciplines, but the ability to afford more than one single aspect, having to do with different profiles, and the latter is clearly more related

with soft abilities. Let us bring some figures to be able to get a quantitative overview of the new skills required and considered in the curriculum revision. Of course not all soft skills described here are new in the curriculum, some of them were already trained before. We give here however the current situation. Out of 180 ECTS, the total number of credits we consider for the bachelor studies, almost 70 are quite directly related with soft skills. Of course not all new skills are taught and exercised through dedicated courses. We have dedicated courses and courses where such non-technical skills are fostered as part of technical practical works and exercises. What we want to reach through dedicated courses within the curriculum is: general improvement in communication (oral and written communication, understanding the problems of intercultural communication), new language learning, career development, interpersonal skills, team building, and entrepreneurship. All these topics are learned and exercised within dedicated courses to an amount of 24 ECTS. The same and other skills will be learned and trained through works in laboratories (15 ECTS), where the students are expected to work divided in groups. Each group needs to be self-organized, will have an own "customer" (and need to understand its importance), will analyze the requirements (activity requiring strong interpersonal skills) and will need to present the results. The presentation is considered an important task within the laboratory requests. Of course the thesis work (14 ECTS) and other required activities or presentations within the curriculum will also exercise soft skills, in some cases more, in some cases less less. This is for instance the case with some modules in the third year that we introduced to foster multidisciplinary collaboration (until 10 ECTS), another important skill that every computer science engineer should train.

We had the opportunity to renew our CS engineering curriculum and we tried to increase the time dedicated to soft skills. We do not have quantitative results to show, measured on our new students, due to the short-term introduction of the revision and due to the difficulty in measuring the direct benefits. We can only say that our effort has been at least appreciated, not last because we tried to explain our intents and the benefits that this can lead to in a longer term. We consider, in fact, that together with the investment in time and courses for soft skills, one important step is to explain the reason of their presence in a technical curriculum. It often happens that students in technical curricula do not appreciate non-technical courses, only because they consider them not useful for their career. Other than pushing them as such, it is then crucial to explain their largely recognized importance in their working life. ∎

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