A syllabus for the Fifties.
Teaching computer science on the first Italian computers.

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Short abstract. The CEP project is the cradle for Italian computer science. Besides delivering the first machine produced in the country (Macchina Ridotta, 1957), it was the seed from which the future Course on Computer Science (1969, again a first for Italy) will develop. Indeed, since its inception the project managers understood the need of courses teaching the use and the possibilities of the newly built machines. This contribution will focus on the contents of the first courses taught in Pisa in 1957 and 1958, and the somehow surprising mix of theoretical informatics, practical applications and programming languages they contained.

Long abstract. The earliest master degrees for computer science have been established by the mid-Sixties, with ample discussions on which should be the syllabi for their courses. At the same time, many teaching activities had already been established by the simple need of providing the reuired expertise for the machines built since the Forties. Concerning e.g. Italy, we know of the network established by Olivetti for allowing technicians to program and interact with its ELEA series. Less information is available e.g. for the courses taught at an academic level. At least for the early Italian computers, though, we are in a privileged position, having available both the original notes and the current reminiscences of the protagonists of these courses at the University of Pisa in the late Fifties.

The CEP project is one of the founding myths of Italian computer science. Hosted by the University of Pisa, supported by the counties of Livorno, Lucca, and Pisa and sponsored financially and technically by Olivetti, in the years 1955-1961 it produced the first Italian computer, called Macchina Ridotta (MR, 1957) and on the basis of such an accomplishment it later delivered the long-running Calcolatrice Elettronica Pisana (the eponymous CEP, 1961). The project can be considered the seed from which the first Italian master degree on computer science (1969) will develop. Moreover, it implicitly contributed to the development of the first Italian transistored computer, one of the earliest in Europe: the ELEA 9003 by Olivetti. The most recent and accurate reconstruction so far of the CEP project is [1].

The original designers apparently undervalued the costs and required times for software development on their machines [1]. However, since the beginning they clearly understood the need of teaching the basics of programming, and its relevance in the spread of the soon-to-be-build machine. What was designed and tested in the project was to be immediately used for the benefit of the transfer of knowledge. Indeed, the activity report of July 1956 also documents the educational activities that were carried out during the first semester for a dozen of graduating engineering students.

The 1956 course was held between March and May. It was split in a few modules, taught by the MR designers, according to their role in the project. While the engineers supported by Olivetti, Giuseppe Cecchini and Sergio Sibani, focussed on the electronic design, the physicists working for the University, Alfono Caracciolo and Elio Fabri, focussed on the architectural and programming aspects, respectively. Concerning the latter, we have an undated technical report containing the notes of the module, most likely the first written text devoted to teaching computer science in Italy [2]. Eight lessons, transcribed and published by Centro Studi Calcolatrici Elettroniche (CSCE), the managing body of the CEP project

(fully subsided by the University of Pisa) [2]. The title "Introduction to the programming of a calculating machine" clearly shows its applied approach, and its tight connection with the actual programming of the first version of MR.

The first lesson indeed introduces the basic of Von Neumann architecture, even if it explicitly states that each word in 18 bits long (as in MR). The second lists the commands available for MR, and illustrates some simple programs. The third and fourth explains in details the (assembly) program for calculating the max of a series of numbers. Most interestingly, lessons 5 through 7 illustrate the use of flow diagrams for program specification, in particular for cycles of possibly undetermined length. The final lesson discusses instead some practical issues: the need of an entry device (in this case, the tape) and of a stored program for the boot, activated by a Manual Control Desk. After a detour on the difference between permanent and temporary memories, the lesson is rounded up by the introduction of the concept of subprogram: its usefulness for programming, and the way to store them.

For the Fifties, among the surviving documents of the CEP projects (scattared among the Pisa archives) we found traces of just another course, held during the academic year 1958/59. This was a fully-fledged course, though, even if only the professor register (briefly annotating the contents of each lesson) was preserved [3]. However, it is remarkable the range of the topics the course deals with in its 45 lessons. A most important aspect is the professor himself: Corrado Bohm, one of the founding father of Italian theoretical computer science, who was by then collaborating with CSCE through Centro Calcoli Numerici of the Technical University in Milan.

The course started in December, 2, 1958, and by then the MR was already disassembled, in order to be cannibalized for the 1961 machine: with the exception of Caracciolo, its designers had already left the project. This reason likely contributed to the less hands-on structure of the course: after laying down the basics of information theory, it moves to binary arithmetic and logics. It offers an introduction on function interpolations, but mostly importantly, at least for the modern viewers, the central lessons deal with Moore automata and Turing machine, as well as adopting a "simplified calculator" ("calcolatrice semplificata") for illustrating some programs.

These two "syllabi" illustrate the attention to the state of the art. For example, the seminal work by Moore on Gedanken-experiments was published just in 1956. Indeed, the course by Bohm (more than the one by Fabri, clearly with a more hands-on attitude) can be considered as one of the first witnesses of a certain idea of the completeness of training: attention to the technological challenges of the moment, but based on a solid conceptual basis to provide the ability to continue to study. One of the basis of the soon-to-be established undergraduate degree in Computer Science.

[1] Giovanni A. Cignoni, Fabio Gadducci. Rediscovering the Very First Italian Digital Computer. Proceedings of 3rd IEEE History of Electro-technology Conference (HISTELCON), IEEE, 2012.
[2] Elio Fabri. Appunti delle lezioni di "Introduzione alla programmazione di una calcolatrice elettronica" (raccolte e redatte da Luigina Bosman Fabri). Technical Report CSCE 35, 1958. Available http://hmr.di.unipi.it/DocCEP/1958_NI1-35-Appunti.pdf
[3] Corrado Bohm. Registro delle lezioni di calcoli numerici e grafici dettate dal Sig. Prof. C. Bohm. University of Pisa, Faculty of Science, academic year 1958/59. Available at http://hmr.di.unipi.it/DocCEP/1959_RegistroBoehm.pdf