

Teaching an advanced processing course with hands-on projects

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Abstract

The present work discusses an advanced processing course with 10 magisterial courses (2h each) where theoretical aspects are covered and three hands-on projects. This advanced manufacturing course follows a basic course reviewing all manufacturing technologies. The courses concern process selection, advanced machining and additive manufacturing. To each of these topics a project is associated where the use of computer technologies for manufacturing is emphasized.

The process selection process uses “CES selector” software (process selection). The aim is to let the students design the processing steps of a piece for which they the drawings and size of series is provided. The students end their project with a presentation with their main conclusions on the process selection, the reason of that selection and a detailed description of the selected process. Each group is given a piece that will lead them to a different process hence covering a wide variety of processes.

The second project, on advanced manufacturing, uses the software “MasterCam” for tool paths and process parameters for a given piece with given material and geometrical features. The students actually make the piece on a CNC milling machine based on their program. In their project presentation, students have to emphasize the choices they have made on process parameters based on theoretical background.

The last project concerns additive manufacturing. The students choose freely a piece and make a drawing with the software “SolidWorks”. They then transform it in a program readable by our fused deposition modelling (FDM) machine and make the piece in polymer. In the presentation, students explain the stages by which they went in the project and the various problems they encountered and how they solved it.

During presentations, the other students are highly encouraged (trough marks!) to ask questions and the teacher is mainly there as observer. This of course works well with a small group.

In parallel to these three projects two industrial visits are organized: to a machining shop, for the part about advanced machining, and to a research center active in additive manufacturing.