This research alludes the study of the optimization of a manufacturing process by machining using computer-aided design (CAD) program for three-dimensional modeling and computer-aided manufacturing (CAM) program in order to simulate the manufacturing of parts by machining process, aiming at the optimization of machining processes with shorter production time. Secondly, the objective is to study the various computational programs in the market and their characteristics, the programming language used and the norms applicable in the representation of the technical drawing and the machining processes. In order to carry out the research, the cutting parameters and cutting force were evaluated in machining process, using ABNT NBR 12545: 1991 and computational simulations using real machine data, tools available and according to the parameters set by the manufacturers. A simulation was performed using the CAM software encompassing several types of machining operations. The economic conditions fundamentals of machining were applied with the purpose of adjusting the parameters and improve the manufacturing. The machining parameters are chosen according to the capacity and limitation of the process, such as geometry, roughing operation, work piece finishing operation and machine / tool system conditions. The concepts of machining time, speed and machining interval are basic in manufacturing process economics. With the variation of the plots of the total cutting time as a function of the cutting speed, one can observe there are three portion to contribute to total cutting time, namely: (1) machining time where the cutting time decreases with the growth of the cutting speed; (2) tool changing time, where the relative time of the tool change increases with the cutting speed; and (3) nonproductive time that is independent of the cutting speed. It is worth pointing out that a survey was made to analyze costs from available CAD/CAM software. Most of software have free license for students and higher education institute fostering academic development. This work allows to assess the integration of CAD/CAM software with a CNC machine and show the ease and agility in the machining and manufacturing processes, besides CAM software allows to obtain a gain in programming time, being possible to test virtually.