

Abstract

The career development and the practice of academic teaching implies a binomial approach of the didactic activity - scientific research activity in a flexible and dynamic way, proving both receptivity to novelty and capacity for critical reflection. Undergoing all the steps of the profession involves the need for life-long learning and training, one of these stages being the submission of the habilitation thesis.

The teaching activity entails the development of the didactic performances both directly by carrying out all types of teaching activities - coordination (course, seminar, laboratory, project, guidance and coordination of the bachelor's and dissertation works), as well as indirectly by publishing teaching material: textbooks and course material, laboratory and project guides, in both traditionally printed form or interactive ones involving multimedia technologies.

Within this context, the teaching activity has focused on supporting the disciplines: Mechanical Installations for Mining, Mining transport and loading equipment in the Mining machines and equipment bachelor program, Mining Transport and Installations in the Mining Engineering bachelor program, Computer aided design in the Mining machinery and Equipment / Equipment for industrial processes bachelor programs and Engineering Design, Mining installations for Transport, Ventilation and Drainage in the Installations and process equipment in mining master program.

The scientific research activity is validated through books, studies, research papers and published works as well as by recognizing their impact. The results of the research activity were presented in national and international conferences, through articles published in journals or in conference proceedings.

The habilitation thesis entitled "Research and results in modeling and simulation of equipment used in the mining industry" presents the synthesis of scientific activities carried out after obtaining my PhD in engineering in 2006, following the public presentation on January 26th of the thesis entitled "Study regarding the improvement of the design methodology for the equipment used in mining" under the coordination of professor Ferenc Koronka.

The habilitation thesis highlights those achievements that attest to the author's ability to coordinate and lead scientific research activities related to the field of Mines, Oil and Gas, especially in the field of mining equipment.

From a structural point of view, this thesis is divided into three parts: Part I - Postdoctoral scientific and professional achievements, Part II - Academic career and scientific research development plan and Part III – Personal and general bibliographic references.

The introductory part presents the objectives of the thesis and summarizes the most important results obtained during the post-doctoral teaching and scientific activity in the first chapter, detailing the main topics addressed and the results obtained in research for a period of 15 years since defending the PhD thesis.

As anticipated from the title of this thesis, these topics are dedicated to the use of information technology in the modeling and simulation of mining equipment, covering two important and modern directions of the mining field:

1. Bucket wheel excavators, specific to open cast mining;
2. Mine hoisting installations, specific to surface and underground transport.

In chapter 2 "Modeling and simulation of the behavior of the ERC 1400 bucket wheel excavator boom", for a virtual model of the boom of this type of excavator we have conducted in three subchapters:

- the modal analysis of the structure of the BWE boom, performed for the scenario involving the presence of the boom support cables, in order to determine the number of modes necessary for the dynamic analysis of the boom;
- the dynamic analysis of the time response under the action of the excavation forces in a permanent cutting regime;
- the dynamic analysis of the frequency response for the excavator boom model, in which the structure response to the action of the excavation forces in a permanent cutting regime is modeled.

Chapter 3 is entitled "Numerical modeling of the temperatures of the braking system of the mine hoist during emergency braking". The thermal behavior of the brake discs and pads in the case of emergency braking was analyzed on a true scale cable drive drum model. For starters, the drum model is built in SOLDIWORKS and the thermal analysis of the disc is performed using the Thermal study module, for four braking decelerations. The same model is then used in Comsol Multiphysics application, and with the Heat Transfer module the temperature variation for both the disc and the brake pads was determined in the case of a complete braking with the highest deceleration from the nominal transport speed.

Part II presents in Chapter 4 the objectives and directions of career development, from a scientific and teaching point of view. The main goal is to obtain the status of doctoral advisor, in the field of Mines, oil and gas, other objectives are channeled towards continuous development of study programs and courses in the field of mining equipment, as an integral part of mining engineering, in trend with international requirements and using modern methods and approaches based on information technology.