

Abstract

The professional evolution and exercise of the profession of university teacher involves approaching the binomial teaching activity - scientific research activity in a flexible and dynamic way, demonstrating both receptivity to the new and the capacity for critical reflection. Going through the hierarchical stages of this profession implies the need for lifelong learning and training, one of the steps being obtaining the habilitation certificate.

Teaching activity involves the development of teaching capacity and performance, both directly through the carrying out of all types of teaching-coordination activities (course, seminar, laboratory, project, guidance and coordination of undergraduate and dissertation works), and indirectly through the design and development of teaching works, textbooks and course materials, traditional, printed or interactive work and project guides based on multimedia technologies.

Educational activity is a dynamic, extremely challenging, but also stimulating activity that requires, in addition to having solid professional knowledge (in the taught field) and pedagogical knowledge. Permanent interaction with students involves permanent adaptation to different personalities, human typologies, in order to attract, stimulate, train them in professional and research activity. This permanent interaction also leaves its mark in a constructive way on my personality and development.

From the academic year 2001/2002 until now I have been carrying out my professional, teaching and scientific research activity within the Department of Mechanical, Industrial and Transport Engineering within the Faculty of Mechanical and Electrical Engineering, University of Petroșani. Within this group I propose to organize and develop my future career and the teaching activity has focused on supporting the disciplines: Mining Technologies, Technological Methods and Procedures/Materials Technology, Basics of Computer-Aided Technological Design.

The scientific research activity is validated by books, studies, research and published works as well as by the recognition of their impact. The results of the research activity were presented in national and international academic and scientific events, through articles published in journals or in conference proceedings. The habilitation thesis entitled "Research on improving the performance of mining equipment through construction and technology using CAD/CAE software" presents the synthesis of the scientific activities carried out from 2001 to the present. In 2009, I obtained the scientific title of Doctor of Engineering Sciences, field "Mines, Oil and Gas", with the work "Improving the performance of mining drilling tools through construction and technology", having as scientific coordinator Professor Dr. Eng. Zamfir Vasile, University of Petroșani.

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 Mining, Oil and Gas, especially in the field of mining equipment.

Structurally, this thesis is divided into three parts: Part I - Post-doctoral scientific and professional achievements, Part II - Academic and scientific research career development plan and Part III - Own and general bibliographical references.

The introductory part presents the objectives of the work and summarizes the most important results obtained in the pre- and post-doctoral didactic and scientific activity in an initial chapter, then detailing the main topics addressed as well as the results obtained in research during the 24 years of academic activity.

As can be anticipated from the title of this thesis, these topics are dedicated to the use of computing techniques in the modeling and simulation of mining equipment, in two important and current directions of the mining field.

In chapter 2, entitled “Constructive and technological improvement of cable tie devices (DLC) and tension equalization devices in them (DEC)”, I carried out the constructive and technological improvement of the cable tie devices DLC-1, 2 and 3, at the beginning of the chapter I presented the construction and operation of the cable tie devices, and then I carried out their constructive improvement. Also within this chapter I carried out the constructive improvement of the cable tension equalization device DEC, I presented at the beginning the construction and operation of the DEC-12 device and then I carried out the constructive improvement of the cable tensioning mechanism and I also carried out the dimensional verification of the connecting piece between DLC and DEC.

Chapter 3 is entitled “Study of safety systems used in extraction vessels, using CAD/CAE software”. In this chapter, the fall arrester type device used in extraction vessels was studied, the extraction vessel of the sludge evacuation installation from E.M. Lupeni was presented, we analyzed the fall arrester device using CAD/CAE software and a new leaf spring for the fall arrester device was designed. Also in this chapter, we studied the safety mechanism with ratchet and shoe brakes of the mining winch used to change extraction vessels, DLCs and DEC, where we made a CAD analysis of the mining winches, the ratchet mechanism and last but not least the shoe or ribbon brake.

Chapter 4 is entitled “Study of felling combines and their cutting elements using CAD/CAE software”, in it we presented the conditions of use of the 2K-52MU felling combine in the individual support felling at E M Lonea, we presented the correlation method of the equipment used together with the combine and we studied the stability of the combine on the conveyor. In the continuation of the chapter we carried out the study of the cutting elements of the felling combines using CAD/CAE software, we presented the construction and operation of the KSW-460NE felling combine, we established the constructive parameters of the $\varnothing 1200$ cutting elements and we adapted the $\varnothing 1200$ mm cutting elements to the KSW-460NE combine.

In chapter 5, entitled “The constructive solution of the simple hoist (pulley) for lifting the skip from E.M. Lupeni”, we designed a simple hoist for lifting the skip from E.M. Lupeni, we found the constructive solution of the simple hoist (pulley) and we presented the functioning and testing of the new skip handling installation designed.

Chapter 6 is entitled “Modernization of certain components of the EsRc – 1400 excavator using CAD/CAE software”. In this chapter I set out to modernize the EsRc – 1400 excavator buckets using CAD/CAE software and I achieved the following requirements: I

analyzed the construction of the buckets, I studied the dislocation process, I showed the modernized excavator buckets, also in this chapter I presented the constructive and technological improvement of the bearing of the rotation mechanism of the EsRc 1400 rotor excavator, I studied the improvement of the functioning of the ball bearing of the rotation mechanism of the EsRc-1400 excavator, I presented proposals for improving the construction of the axial ball bearing used in the EsRc-1400 excavator and I performed a finite element analysis of the contact between the ball and the raceways.

Part II presents in Chapter 7 the objectives and directions of evolution and development of the career, from a scientific and didactic point of view. The main goals consist in obtaining the right to conduct a doctoral degree in the field of Mining, Oil and Gas as well as in the continuous development, in line with global trends and using modern methods and approaches based on computing technology, of specializations and study disciplines in the field of mining machinery and equipment, as an integral part of mining engineering.