

## **Executive Summary**

### **Doctor of Philosophy Degree in Mechanical Engineering with Dissertation in Intelligent Energetic Systems at New Mexico Institute of Mining and Technology**

The Department of Mechanical Engineering at New Mexico Institute of Mining and Technology (NMIMT) proposes a new Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems. The Ph.D. program is aimed at addressing educational needs of emerging markets in intelligent mechanical systems, explosives engineering, and national security. The purpose of the proposed program is to provide graduate education and training in the mechanical engineering discipline focusing on research, development and practical applications of intelligent systems, energetic materials, and state-of-the-art security practices in private industry and governmental entities. The program explores system engineering thinking, knowledge of energetics, use of innovative design techniques, and cross-disciplinary analysis of system elements for applications in explosives engineering, smart systems and intelligent structures. It is due to the fact that all modern energetic or explosive systems incorporate some form of intelligence and real time analytics that this program represents technological innovation and the next step in explosives science and engineering.

Need for the program comes from diversity of New Mexico business enterprises and growing interest in national security, energetics, and intelligent systems in general. There is no in-state and out-of-state duplication due to specific interconnection between intelligent systems and energetics. In this respect, the program is uniquely positioned to serve students interested in engineering smart/intelligent/adaptronic systems and explosives science.

It is anticipated that the main clientele of the program will consist of recent bachelor or master engineering degree graduates, qualified working professionals, as well as qualified staff members of national laboratories and other governmental entities. Projected full-time and part-time student enrollment for the first 5 years of the Ph.D. program is 14 students. Students will be supervised by a growing number of mechanical engineering faculty with involvement of faculty from other departments and adjuncts. Financial support of the Ph.D. students will mainly come from faculty research and scholarships provided by industry, government, and foundations. The Ph.D. students will also enhance faculty research allowing for more complex topics to be approached. Procedures already implemented for assessment of the existing M.S. program in Mechanical Engineering will be used to evaluate operation and impact of the proposed Ph.D. program.

The program will be administered by the Department of Mechanical Engineering. In addition, it is projected that other departments and NMIMT divisions (e.g. EMRTC) will contribute to program operation. The Mechanical Engineering Ph.D. program with Dissertation in Intelligent Energetic Systems is well aligned with NMIMT's strategic plan and current educational/research directions.