

## **Nuclear Reactor Instrumentation and Control (I&C) and Digital I&C Implementation**

### **Executive Summary**

The objective of this project is to develop and disseminate comprehensive undergraduate and graduate courses that will include reactor control, instrumentation, digital I&C, discussion on licensing issues, and case studies of digital implementation in current commercial reactors and new construction reactors. These courses will address the following subject areas: reactor system design, reactor kinetics/dynamics, control strategies, fundamentals of linear system control theory, design of classical controllers, introduction to modern control systems, digital devices such as the field programmable gate arrays (FPGA) and others, examples of applications of digital I&C in operating reactors, and regulatory issues related to digital I&C. This course would provide a sound background in basic control systems with emphasis on digital I&C systems in nuclear reactors.

The implementation of digital I&C systems is being considered by nuclear utilities for system upgrades of current reactors, and for next generation nuclear reactors. For these reasons, there is an urgent need to train the next generation nuclear engineers and I&C personnel in the areas of instrumentation, controls, and digital systems. The current research and development activities by the co-PIs on the implementation of reactor monitoring, diagnostics, and digital protection and control systems provide a unique resource for the development of highly effective courses for both university students and industry professionals. The deliverables will include a comprehensive write-up of the course materials with examples and worksheets, PowerPoint slides for class lectures, and examples of applications to commercial reactors and research reactors.

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