

PREFACE

Engineering design, whether applied to components, products, systems or processes, involves the development and application of technology and scientific knowledge to a complex, multidisciplinary innovation-process. Research in design methodology involves both the development of new engineering design methods and the study of the science of design methods and design practice. In **ICSAAM 2011** Current research activities in engineering design include the following topics.

Uncertainty and Risk Management in Engineering Design: Much of the information used to support decisions made in the processes of design, development, or use of engineering systems is approximate in nature. Whether the information has been developed from observations, experiments, mathematical analysis or numerical simulation, its accuracy is limited by a variety of assumptions. Research in this area is intended to provide the design engineer with methods to characterize and deal with information uncertainty during the design process.

Design Process Simulation: Computer simulations provide powerful tools to support the study of design and the behavior of the designer. Using design process simulations, the decision-making behavior of the individual designer and design teams can be monitored, studied and assessed. Of particular interest are: modeling the interaction between the technical factors, business factors and human factors during the design process; exploring the role of questions during design team interactions; and using design process simulations in design education.

Multidisciplinary Optimization: Much effort has been expended in the past few decades to exploit the computation capabilities provided by digital computing through the development, integration and automation of sophisticated, multi-physics modeling techniques. These analyses capabilities provide an overwhelming amount of information to the designer and to be effectively used, algorithms need to be developed to efficiently use computer-based models in the system design process. Previous work in this area has included the use of soft-computing techniques such as artificial neural networks, genetic algorithms and simulated annealing to develop approximate design space meta-models for multidisciplinary optimization.

Engineering Design Education: Teaching discipline-specific knowledge has been the strong-suite of engineering education in the world. Significantly less emphasis has been placed on exploring the pedagogy associated with the application of discipline-specific knowledge to the engineering design process. Design thinking - involving creativity, innovation, synthesis and divergent thinking - is quite different from the approaches associated with traditional engineering analysis - a convergent thinking process. Projects are being pursued to explore how to develop, implement and assess interdisciplinary design education activities involving faculty from engineering, industrial design,

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