**Invited Seminar**

12.00pm, June 14, 2018

Conference Room, Department of Mechanical Engineering & Aeronautics

**Multi-Fidelity Analysis for Design Optimization**

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**Abstract:** This work presents an approach for designing mechanical and aerospace systems in an optimal manner. Engineering systems design requires an understanding of, and ability to model, the underlying physics and behaviour. Physics-based modelling is a fundamental necessity for accurate design of systems. Full physical modelling can be extremely time consuming in both the construction of these physical models as well as the computational solution time associated with the model. Consequently, traditional design techniques have resorted to utilization of lower order, reduced physical interaction, and surrogate-based modelling techniques. These techniques allow for a computationally efficient design in most cases, but result in suboptimal, inaccurate, and/or unreliable designs even through the employment of optimization methodologies.

Multi-fidelity design is a methodology developed to mitigate inadequacies and/or obstacles associated with these traditional design techniques. Achieving a desired level of accuracy while maintaining a low computational cost may very well be the greatest obstacle combating computational design. However, other hindrances such as determining the appropriate physics (i.e. aerodynamic, thermal, structural, acoustic, etc.), level of physics (i.e. Potential Flow, Euler, Navier Stokes, etc.), and mesh refinement to utilize in any given computational model exist. This work focuses on leveraging higher fidelity information to correct lower fidelity models. Ultimately, this takes advantage of the speed associated with the lower fidelity/reduced models without compromising accuracy. Utilizing a combination of surrogate modelling, Bayesian statistics, and adaptive trust region techniques allows the design optimization.

**Biography**

Dr. Ramana Grandhi is the Distinguished Research Professor at Wright State University. His research interests are in multidisciplinary analysis and optimization, structural dynamics, probabilistic mechanics, and finite element methods. He is the author of over 170 journal papers, 210 conference articles, and one textbook. Dr. Grandhi’s sustained contributions in teaching and research have resulted in numerous awards: *ASME Fellow, AIAA Fellow, AIAA MDO Award, The Solberg Award from the American Society of Naval Engineers, TANA Award for Excellence in Engineering, The Outstanding Engineers and Scientists Award from the Engineering and Science Foundation of Dayton, the Brage Golding Distinguished Professor award, the UP & COMERS Award from the Price Waterhouse, DOW Outstanding Faculty Award from ASEE, and RALPH R. TEETOR Educational Award from SAE.*

For more information please contact. Prof. D. Saravanos