

SEMINAR SERIES  
Department of Quantitative Analysis and Operations Management  
College of Business Administration  
University of Cincinnati

**“Firefighter Staffing with Overtime, Attrition, and Random Absenteeism”**

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**12:30 p.m.**

**214 Lindner Hall**

Our research examines the problem of determining optimal staffing levels for emergency personnel such as firefighters. There are several factors that make this a particularly interesting problem. Because of their social importance, there is a minimum number of firefighters that are required to be on-duty at any time. However, the actual number of firefighters available for assignment at any particular time is influenced by both temporary absences and permanent attrition due to retirement, injury, etc. Furthermore, due to training requirements, it is often only possible to bring in a new group of firefighters once per year.

We analyze this firefighter staffing problem by relating it to traditional inventory models. We develop a robust model that allows for randomness in both temporary absences and permanent attrition, and we analytically characterize optimal solutions. We also perform numerical work that aids in establishing important managerial opportunities for cost improvement and compares our optimal solutions to heuristic solutions currently used in practice.

Michael J. Fry is Assistant Professor of Operations Management. He received his M.S.E. and Ph.D. in Industrial and Operations Engineering from the University of Michigan in Ann Arbor, and he is a summa cum laude graduate from Texas A&M University with a Bachelor of Science degree in Industrial Engineering. His research interests include supply chain management, inventory control, logistics, and the stochastic modeling of manufacturing systems. Dr. Fry's work has appeared in the journal *Manufacturing and Service Operations Management*, and he has also co-authored a chapter for the book *New Directions in Supply-Chain Management: Technology, Strategy, and Implementation*. Dr. Fry serves as the Educational Chairperson for the Greater Cincinnati Chapter of the Council of Logistics Management, and he is an active member in INFORMS and the Institute of Industrial Engineers.

Michael J. Magazine is Associate Dean for Faculty and Research, Professor of Quantitative Analysis and Operations Management and Ohio Eminent Scholar. After completing his PhD at the University of Florida in Industrial and Systems Engineering, he taught at North Carolina State University and at the University of Waterloo. In addition, he has had visiting appointments at PUC in Brazil, INRIA in France and Georgia Tech, MIT and the University of Michigan. He is a Professional Engineer. His research interests include scheduling, supply chain management and other applications of manufacturing systems. He has worked on the design and analysis of heuristics and applications in the production and manufacturing area and has been the holder or coholder of several research grants in this area. He has published over fifty papers in these areas. Dr. Magazine has served on the editorial boards of several journals and was the Area Editor of *Operations Research for Manufacturing, Operations and Scheduling*. He has been on the ORSA, TIMS and CORS Councils and is currently VP-International for INFORMS. In addition, Professor Magazine has been President of the INFORMS Section on Manufacturing and Service Operations Management.

Uday Rao is an Associate Professor of Operations Management at the College of Business Administration, University of Cincinnati. He holds a B.Tech. in Mechanical Engineering from the Indian Institute of Technology, and a Ph.D. in Operations Research and Industrial Engineering from Cornell University. Dr. Rao has taught at Carnegie Mellon University, the University of British Columbia and Cornell University. He has consulted with companies such as Lucent Technologies, Caterpillar Inc., and Ford-Visteon. Dr. Rao's current research interests are in quantitative models for capacity decisions (risk-based strategic planning, tactical resource allocation, and real-time utilization), periodic production systems and remanufacturing, inventory control logistics (under uncertainty), supply chain optimization (design and coordination), telecom network planning (broadband-access), workforce planning, and simulation (quasi Monte-Carlo). His research has been published in journals such as *Management Science*, *Operations Research*, and *IIE Transactions*; he serves on the editorial board of *Manufacturing & Service Operations Management*.