COLLEGE OF ENGINEERING **WORKSHOP** SERIES

"3D Printing: From Principles to Crosscutting R&D Opportunities"

Monday, 26th of January 2026, Room 1A58

Speaker 1: **Dr Abdulrahman AlAhmari**, Professor of Industrial Engineering, KSU
Title: "3D Printing: Principles, Status and Prospects" (20 Minutes)
Abstract: This talk provides an overview of 3D printing technology, covering its fundamental principles, the additive manufacturing process, and key applications across medical, aerospace, automotive, and consumer sectors. It examines the rapidly growing global market and explores innovation opportunities in materials development, design for additive manufacturing (DfAM), and emerging technologies including AI, robotics, and connectivity that will shape the future of remote 3D printing.
Biography: Prof. Abdulrahman Al-Ahmari is a distinguished scholar in Advanced Manufacturing Systems, Industry 4.0, and Product Innovation. He earned his Ph.D. in Manufacturing Systems Engineering from the University of Sheffield, UK, in 1998. Throughout his career, he has held key leadership roles, including Dean of the Advanced Manufacturing Institute, Director of the Research Center of Excellence in Engineering Materials, and Chairman of the Industrial Engineering Department. He founded several pioneering initiatives, including the Advanced Manufacturing Institute, the Princess Fatima Al-Najres Research Chair, and the Raytheon Chair for Systems Engineering. Prof. Al-Ahmari has authored over 200 peer-reviewed publications, holds 10 patents, and has led more than 20 funded research projects, making significant contributions to manufacturing systems engineering and innovation methodologies.

2nd talk: Additive Manufacturing: An Overview of the Process Categories

Speaker 2: **Dr. Abdullah AlFaify,** Associate Professor of Industrial Engineering, KSU
Title "Additive Manufacturing: An Overview of the Process Categories**"** (20 Min)

Abstract: This talk introduces Additive Manufacturing (AM), or 3D printing, as a transformative manufacturing approach that builds components layer by layer directly from digital models. The presentation begins by positioning AM within the broader landscape of manufacturing processes and highlighting its fundamental differences from traditional subtractive and formative methods. Using standardized definitions, the talk provides a clear overview of the main categories of additive manufacturing technologies and explains their basic working principles and typical applications. The presentation then highlights key applications, benefits, and future trends in additive manufacturing.

Overall, this talk aims to provide workshop participants with a clear and practical understanding of additive manufacturing technologies and their growing role in modern engineering and industrial applications.

Short Biography: Dr. Abdullah Yahia M. AlFaify is an Associate Professor of Industrial Engineering and Vice Dean for Graduate Studies and Scientific Research at the College of Engineering, King Saud University (KSU). He earned his PhD. in Advanced Manufacturing Engineering (Additive Manufacturing)

from The University of Sheffield's Advanced Manufacturing Research Centre (AMRC) with Boeing, UK in 2019, his MSc. in Mechanical Engineering from the University of Ottawa in 2013, and his BSc. in Industrial Engineering from KSU in 2004. His research focuses on advanced and additive manufacturing technologies, material development for 3D printing, product innovation, and manufacturing-system optimization, with applications aligned to Industry 4.0. He has published over 40 peer-reviewed papers in journals. He holds a U.S. patent for improving powder-bed additive manufacturing machines.

At KSU, Dr. AlFaify established the 3D Printing Laboratory, and has taught advanced manufacturing courses, including IE 654: Advanced Topics in Manufacturing Processes, IE 488: Additive Manufacturing Technologies, IE 461: Computer-Integrated Manufacturing, and IE 352: Manufacturing Processes II.

He has delivered invited talks and seminars in governmental, industrial, and academic organizations to promote the adoption of emerging manufacturing technologies, the Fourth Industrial Revolution and sustainable production practices.

Speaker 3: **Dr Magdy El Rayes.** Professor of Mechanical Engineering, KSU
Title ""Wire Arc Additive Manufacturing: Applications and Challenges" (20 Min)
Abstract: Wire Arc Additive Manufacturing (WAAM) is an emerging large-scale metal additive manufacturing technology that utilizes an electric arc as a heat source and wire as feedstock, offering high deposition rates and cost efficiency. This presentation reviews the main WAAM process variants, including GMAW-, GTAW-, Plasma-, and CMT-based systems, and summarizes the current state of the art in process control, materials, and microstructural tailoring. Key challenges such as heat accumulation, residual stresses, anisotropy, surface quality, and dimensional accuracy are discussed in comparison with powder-based AM technologies. Recent technological advances in hybrid manufacturing, real-time monitoring, and process modeling are highlighted. The presentation further surveys industrial applications in aerospace, marine, energy, and structural components. Finally, future research directions are outlined, emphasizing standardization, closed-loop control, multi-material deposition, and qualification for critical engineering applications.

Short Biography Prof. Magdy El Rayes is a researcher and academic specializing in conventional and advanced manufacturing processes and materials engineering, with a focus on severe plastic deformation processes, welding, thermal spray coating, and metal additive manufacturing. His research interests include accumulative roll bonding (ARB), friction stir welding and processing (FSW/P), microstructural evolution, mechanical characterization, and process–structure–property relationships in aluminum alloys and stainless/ duplex and high alloy steels. He has contributed to research projects/studies on non-destructive materials characterization, deformation mechanisms, metal matrix composites, and defect formation in conventional and additive manufacturing processes. Prof. El Rayes is actively engaged in experimental analysis, microscopy, and materials characterization, and participates in developing educational and research-oriented engineering solutions.