

College of Engineering and Physics
Mechanical Engineering Department

**Sustainable Pathways in Metal Additive Manufacturing:
Decoding Laser, Arc, and Friction Stir Heat Source Mechanisms**

Speaker:

Professor Dr. Muhammad Sohail

Professor
Department of Materials Engineering
NED University of Engineering and Technology



Date: Wednesday: Sep 30, 2026

Time: 1:30 – 3:00 PM

Location: Building 63 – Room 362

Abstract:

Metal additive manufacturing processes differ fundamentally according to their heat sources and material-consolidation mechanisms. Laser and arc-based methods rely on melting and re-solidification, with laser systems offering precision and deep penetration, arc systems providing higher deposition rates, and hybrid laser–arc systems combining both advantages while reducing defects. However, these fusion-based processes involve extremely high temperatures and may introduce limitations associated with melting and vaporization. Friction Stir Additive Manufacturing offers a sustainable solid-state alternative, using severe plastic deformation and dynamic recrystallization to produce refined microstructures, strong metallurgical bonding, and lower energy consumption. This study compares these approaches in terms of sustainability, energy efficiency, microstructural control, and the key parameters guiding process selection.

Bio:

Dr. Muhammad Sohail is a Professor of Materials Engineering at NED University, Karachi, holding a Ph.D. in Mechanical Engineering from KAIST, South Korea. With nearly two decades of experience, his expertise includes laser and plasma processing, welding, corrosion science, and sustainable manufacturing. He has led nationally funded research projects, published extensively, and contributed to curriculum development, accreditation, conferences, and engineering education through teaching and mentorship.