TMS | ONLINE COURSE

PROCESSING-STRUCTURE-PROPERTIES FOUNDATIONS IN ADDITIVE MANUFACTURING

January 10–13, 2022 • Learn more and register at **www.tms.org/AMcourse**

DISCOUNT REGISTRATION DEADLINE: DECEMBER 17, 2021

Processing-Structure-Properties Foundations in Additive Manufacturing is designed for industry professionals, researchers, and university students, as well as leaders and managers who would like to gain new knowledge and skills in additive manufacturing (AM).

COURSE SCHEDULE

Day/Time	Instructor	Format
Module 1: Process Development in Direct Metal Additive Manufacturing Technologies		
This module will present a high-level overview of processing in direct metal AM technologies and their industrial applications. Then, we will provide a deep dive into the process design framework using the laser powder bed fusion technology as an example. We will specifically focus on (i) identifying the processing parameters, (ii) developing and utilizing experimental and computational process models, and (iii) discussing available experimentation, process monitoring, and data analysis techniques. Finally, we will present the latest studies using advanced characterization methods to understand multiphysics phenomena.		
January 10, 2022 • 9:00 a.m. to 12:00 p.m.	**Sneha P. Narra**, Carnegie Mellon University	Live instruction
January 10, 2022 • 1:00 p.m. to 4:00 p.m.	**Nadia Kouraytem**, Utah State University	Live Instruction
Module 2: Microstructure Development		
Solidification behavior primarily governs microstructural development during the build process for most AM technologies, which is highly dependent on material chemistry, AM processing variables, and thermal transport. Solid-state microstructural evolution can also occur within prior deposited layers during the build process and within the entire component during post-build thermal processing. Other AM technologies, for example binder-jet, ultrasonic, and friction-stir AM, are entirely solid-state processes where material microstructures are affected by variables such as binder burn-off and sintering behavior, mechanical deformation heat imparted by a friction stir tool, or by subsequent post-build thermal processing. This module will introduce the fundamental relationships between AM processing variables and the thermal profile (in situ and post-build) experienced by the component on microstructure development in AM materials.		
January 11, 2022 • 9:00 a.m. to 12:00 p.m.	**Eric A. Lass**, The University of Tennessee, Knoxville	Live Instruction
January 11, 2022 • 1:00 p.m. to 4:00 p.m.	**Alex Plotkowski**, Oak Ridge National Laboratory	Live Instruction
Module 3: Properties		
This module will cover the properties of AM materials. It will compare AM static and dynamic properties to other manufacturing processes and the test methods will be reviewed. Material mechanisms influencing failure will be discussed, including microstructure and defects. Ultimately, the failure mechanisms and properties behavior will be connected back to AM processing and post-processing conditions.		
January 12, 2022 • 9:00 a.m. to 12:00 p.m.	**Joy Gockel**, Colorado School of Mines	Live Instruction
January 12, 2022 • 1:00 p.m. to 4:00 p.m.	**Amber Andreaco**, GE Additive	Live Instruction
Module 4: Project Kick-off		
The final module will be a self-paced project where participants will apply knowledge from the previous processing, structure, and properties modules to analyze an AM material data set. Example analysis tasks will be provided while each individual also has the freedom to drive the project in a direction that is of most interest to them. Project participants will have the option to present a poster at the 2022 TMS Annual Meeting showcasing their analysis and insights in connecting the processing-structure-properties relationships for AM.		
January 13, 2022 • 9:00 a.m. to 12:00 p.m	**Joy Gockel**, Colorado School of Mines	Hands-on Activity