



THE LAURA & ALVIN SIEGAL
LIFELONG LEARNING
PROGRAM



CWRU SLLP Lightweighting Course Outline at ASM International Headquarters

Course Title: Design for Advanced Manufacturing for Lightweighting Certificate

2022 Course Date: Tuesday, April 5, 2022 from 9AM-4:30PM ET

Course Location:

Onsite at ASM World HQ, 9639 Kinsman Road, Materials Park, OH 44073-0002 & Online from 9AM-4:30PM ET

Note: Earn CEUs to advance your career; Ohio TechCred

CWRU Registration online: <https://case.edu/cps/lift-courses>

Course Agenda:

9:00-10:30 AM Introductions (CWRU & ASM), Advanced Materials Curriculum (Bianco, Heil)

10:30 AM – 10:45 AM Break

10:45AM - 12:00 PM Advanced Materials Curriculum (Bianco, Heil)

12:00-12:30PM Special Presentation: NASA GRC Lightweighting Case Study, presented by: Dr. Ajay Misra serving as the Deputy Director of Research and Engineering at NASA's John H. Glenn Research Center (GRC) in Cleveland

12:30PM-1:15PM Lunch on site for attendees at ASM International

1:15-3:00 PM Design for Additive Manufacturing Curriculum (Collins, Pearson)

3:00-3:15 PM Break

3:15-4:30 PM Design for Additive Manufacturing Curriculum (Collins, Pearson)

Learning Objectives:

- Learn uses of engineering advanced materials across industries
- Know end-use markets that drive lightweighting materials selections

- Understand lightweighting design for aviation
- Understand practical uses of alternative materials, material replacements and mass reduction
- Learn design methodologies for lightweighting
- Recognize leading concepts to select advanced materials for lightweighting for increased performance
- Discern methods of advanced manufacturing for problem solving in aviation lightweighting
- Gain insights into practical problems through case study analysis
- Appreciate where additive manufacturing (AM) technologies can be applied for design or economic advantage
- Gain an understanding of special tools in advanced materials for lightweighting
- Appreciate future trends in advanced materials
- Perform hands on practical applied problem solving in lightweighting and share your ideas with your work teams

Advanced Materials Overview:

Morning Program Outline:

- Basics - introduction to engineering advanced materials
- End-use markets that are driving use of lightweighting materials Principles of materials science Lightweighting – alternative materials, materials replaced and mass reduction
- Design methodologies for lightweighting
- Advanced materials for lightweighting for increased efficiency- ferrous, nonferrous, others (e.g. polymers, ceramics, advanced composites)
- Using alloys- advantages and disadvantages Lightweighting application examples
- Failure mechanisms
- Advanced manufacturing- powder metallurgy, characterization, casting, forging, additive manufacturing
- Important considerations- corrosion, materials degradation, fatigue, durability, maintainability, etc.
- Business case development Future trends in advanced materials

Dr. Robert Bianco is an instructor in Siegal's Lifelong Learning Program Continuing Professional Studies at Case Western Reserve University. Bob is a materials expert and technical lead for Swagelok's Additive Manufacturing Program. Prior to joining Swagelok, Bob began his professional career in 1997 at Goodrich's (now United Technologies Aerospace Systems) Materials and Simulation Technical Center where he held positions of increasing responsibility culminating as the Manager, Materials and Process R&D before his departure. He led a group of scientists and engineers to advance the state-of-the-art in materials and their processes for the aerospace industry. Prior to joining Goodrich, he was a Senior Engineer at Westinghouse's Bettis Atomic Power Laboratory responsible for the development of material systems for advanced energy conversion applications. Bob earned a B.S., M.S., and Ph.D. in Metallurgical Engineering from The Ohio State University and an Engineering and Technology Management Certificate from Caltech's Industrial Relations Center. Bob has authored 13 refereed journal articles, 50+ internal technical reports; 18 patents issued or filed, 40 invention records submitted; and 50+ presentations.

Dr. Michael L. Heil, Case Western Reserve University instructor is an independent aerospace and defense consultant with over 40 years' experience in aerospace research, development, test, acquisition, and higher education. From 2007 to 2016, he served as President and CEO of the Ohio Aerospace Institute (OAI), a 60 person, \$17M annual budget non-profit aerospace research and educational institute with offices in Cleveland and Dayton. Prior to joining OAI, Michael served as Director, Center for Space Studies and Research at the Air Force Institute of Technology. He retired from Air Force active duty in 2005 at the rank of Colonel after serving as Director of the Air Force Research Laboratory's Propulsion Directorate with responsibilities for propulsion and power research at Wright-Patterson and Edwards Air Force Bases. A distinguished engineering graduate from the U.S. Air Force Academy, class of 1975, Michael earned a master's degree in flight structures from Columbia University on a Guggenheim Fellowship

and a doctorate in aerospace engineering from the Air Force Institute of Technology. He served as Commander, Phillips Laboratory; Commander, Arnold Engineering Development Center; and Commandant of the Air Force Institute of Technology. He has served in two Air Force acquisition centers, four defense laboratories, a test center, a major command staff, the Office of the Secretary of Defense, and the faculties of the Air Force Academy and Air Force Institute of Technology. He is a Fellow of the American Institute of Aeronautics and Astronautics.

Afternoon Program Outline:

Design for Additive Manufacturing Overview:

- Learn where Additive Manufacturing (AM) technologies can be applied for design or economic advantage
- Understand lightweighting AM technologies, trends and applications in transportation industries
- Demonstrate problem-solving skills in lightweighting through analysis of case studies
- Learn the fundamentals of materials science and how to improve properties such as strength, stiffness and ductility in a wide array of lightweight material options
- Understand the use of advanced materials databases (e.g., Granta) and the impact of key market drivers on the selection criteria for critical applications in the transportation industry

Learning Objectives

- Understand practical uses of AM and advanced materials in advanced manufacturing
- Learn to diagnose and solve practical problems using additive manufacturing
- Gain insights into practical problems through case study analysis

Sunniva R. Collins, Ph.D., FASM Past President, ASM International 2014-2015 Associate Professor, Mechanical and Aerospace Engineering Case Western Reserve University Cleveland, Ohio. Sunniva Collins joined the faculty of the Case School of

Engineering at Case Western Reserve University in March 2013, where she teaches Materials, Design, and Manufacturing courses in the Department of Mechanical and Aerospace Engineering. She is also contributing to the university's initiatives in advanced manufacturing. Prior to CWRU, Collins was employed by Swagelok Company for 18 years. As senior research fellow at Swagelok Company, Collins was responsible for coordinating the company's academic and governmental research partnerships.

Dave Pierson is a Senior Design Engineer for MAGNET and a notable figure in the advanced manufacturing community. He has 23 years of varied and practical additive manufacturing training experience as well as 40 years of experience in mechanical and electric engineering and programming. Pierson regularly develops and delivers training curriculum and trains operators, students, and engineers on past and present additive techniques. His experience covers seven AM standards categories as set by the American Society for Testing and Materials.

Course Cost:

Course Cost On Site at ASM & online: \$1,099/participant

Corporate package discounts available. Companies who bring three or more participants to a lightweighting course are eligible for a discount of 10% of the course cost.

Registration: Through ASM Website and CWRU CPS website. <https://case.edu/cps/lift-courses>

Please contact Andrea Rubin, Director of Program & Outreach Engagement at The Laura & Alvin Siegal Lifelong Learning at CWRU at 216/368-3460 or andrea.kushnickrubin@case.edu for more information.