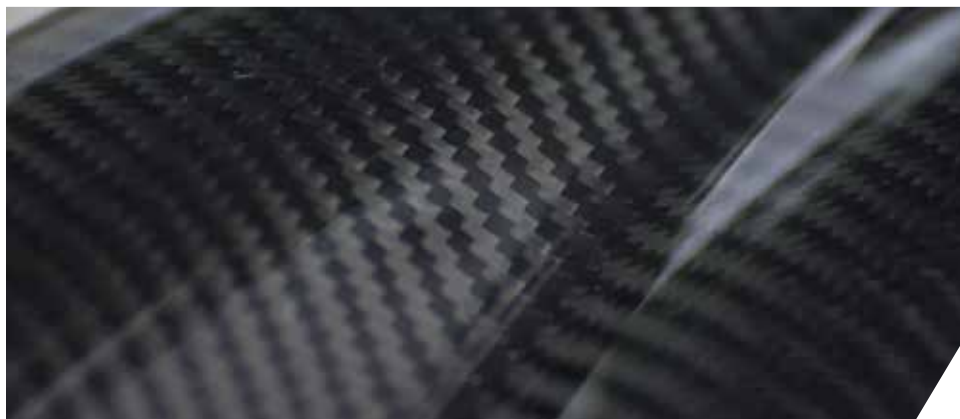


MANUFACTURING & MATERIALS TECHNOLOGY

EDUCATION & TRAINING GUIDE

August – December 2017



FEATURED COURSES

- **COMING SOON!** Design for Additive Manufacturing: Towards End-Part Production | [Page 4](#)
- **NEW!** Material Selection Process for Engineering Designs | [Page 6](#)
- Corrosion Engineering and Prevention | [Page 8](#)
- Vehicle Sound Package Materials | [Page 12](#) & [Page 13](#)

PLUS—Explore Related Manufacturing & Materials Technology Resources on pages 16–17!

HOW DO YOU STAY UP-TO-DATE AND SECURE TIMELY INFORMATION IN YOUR TECHNOLOGY FOCUS AREA?

Look to SAE International as your most critical resource for lifelong training and professional development. In this issue of the **Manufacturing & Materials Technology Education and Training Guide**, you'll find an extensive portfolio of courses designed to keep you ahead of the industry.

PLUS - don't miss the suggested Related Manufacturing & Materials Technology Resources on pages 16-17. We've selected key SAE books, standards, journals, and technical events to further your professional development and deepen your technical knowledge.

THIS GUIDE INCLUDES EDUCATION & TRAINING AND KNOWLEDGE RESOURCES IN THE FOLLOWING TOPIC AREAS:

- Manufacturing
- Materials
- Metallurgy



EARN A CERTIFICATE OF ACHIEVEMENT FROM SAE

SAE multi-course certificates provide an outline of courses designed to extend your understanding in a specific technology area. When reviewing SAE education and training material, watch for the certificate icon. It indicates which courses are part of an SAE multi-course certificate program. For a list of programs, visit training.sae.org/credentialing/certificate.

WHY SAE? WHAT OUR CUSTOMERS ARE SAYING

"Relevant, realistic, and informative."

(In reference to Vehicle Sound Package Materials Web Seminar - page 12)

Zakir Ahmed

Sr. Manager - Process Engineering; Volkswagen India Pvt. Ltd.

"The instructor presented the material in an enthusiastic and understandable way."

(In reference to Material Selection and Testing for Plastics - page 11)

Susan Collet

Senior Principal Engineer, Materials Engineer; Toyota Technical Center USA, Inc.

SAE CUSTOMER SERVICE

Contact SAE Customer Service for any questions concerning schedules, fees, locations, or registration.

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A LEARNING FORMAT TO FIT EVERY NEED

As the world's leader in offering access to the most extensive, multi-sector source of knowledge and expertise, SAE International provides the mobility engineering training and education needed to turn your challenges into solutions.

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SAE International offers a variety of learning formats to accommodate diverse learning styles. Explore classroom, live and online, and on demand courses.

Many courses are offered in multiple formats to fit your exact need. Be sure to watch for the icons that identify the format available for each course.

Seminars or workshops available as similar live, online web seminars or on demand courses, will feature icons and information about the schedule and fees for all platforms.

CATALOG KEY

Look for the icons below with the course descriptions. The icons indicate delivery formats for the course and whether the course is part of an SAE Certificate program.

Many courses are available in multiple formats. In addition to finding courses that fit your technology need, look for courses with icons that fit the way you want to learn.



CLASSROOM

indicates that course is an instructor-led seminar or workshop offered in a classroom setting



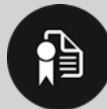
LIVE ONLINE

indicates this course is an instructor-led webinar offered live and online via telephone and internet connection



ON DEMAND

These offerings are available online anytime the participant would like to access the course through the internet



CERTIFICATE

This icon indicates that this course is part of an SAE International curriculum-based, multi-course certificate

As an IACET Authorized Provider, SAE International offers CEUs for its programs that qualify under the ANSI/IACET Standard.

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16 RELATED MANUFACTURING & MATERIALS TECHNOLOGY RESOURCES

To help you better plan your training, we schedule live course offerings as far in advance as possible. The content in this resource guide reflects the most accurate information available at the time of publication. Rarely, unforeseen circumstances may force a change to the schedule. Early registration ensures that you not only have a spot in your selected course but are notified of any changes. For the most-up-to-date listing of scheduled courses, visit training.sae.org/all/bydate. SAE International reserves the right to cancel offerings and cannot be held responsible for costs incurred beyond registration fees.

AUTOMOTIVE PLASTICS: PRINCIPLES OF MATERIALS AND PROCESS SELECTION



Plastic - any class of synthetically-produced organic compounds capable of being molded and hardened into a specific shape or form. This course is designed to offer a basic understanding of plastics and plastic processing. This seminar will walk you through the molding process, provide a comprehensive look at the variables in the manufacturing mix, and review characteristics of typical automotive plastics such as PP, PVC, ABS, and more. This seminar will also cover troubleshooting molding mistakes and alternative processes, and review the selection of an application's appropriate plastic material. Material presented is both an excellent foundation for further development and an extensive update for those already working in the field.

LEARNING OBJECTIVES

By attending this seminar, you will be able to:

- Demonstrate an understanding of typical automotive plastics and primary and application-specific plastics processing methods
- Recognize key plastics terminology and parameters related to plastics
- Explain alternative molding processes
- Prevent or reduce molding mistakes
- Understand the molding cycle
- Troubleshoot the processing operation

WHO SHOULD ATTEND

This seminar is designed for those who are new to automotive plastics, as well as those who have some experience. The program will benefit product designers, process engineers, purchasing agents, project engineers, manufacturing engineers, material engineers, and sales and marketing professionals.

CONTENT HIGHLIGHTS

- Introduction to Injection Molding
- The Injection Molding Machine
- The Molding Cycle
- Typical Injection Molding Mistakes
- Mold(s)
- Function

INSTRUCTOR

Robert G. Speirs

Associate Professor of Plastics Programs, Ferris State University

Using plastics can be simple, but there is much more behind producing high performance plastic parts.

I.D.# C0135

SCHEDULE

Future dates may be scheduled for this course. Check the course web page for the most up-to-date schedule and information.

FEES

List: \$1,370

Members

Classic: \$1,233

Premium: \$1,165

Elite: \$1,096

TWO-DAYS/1.3 CEUS

Get more information and register:

training.sae.org/seminars/c0135/

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COMING SOON! DESIGN FOR ADDITIVE MANUFACTURING: TOWARDS END-PART PRODUCTION



This web seminar fills a gap between designers that are familiar with design tools and the emerging technologies of Additive Manufacturing, which are mostly in the manufacturing domain in most organizations. The goal of this course is to give designers the information they need to start designing for AM at all levels –identifying and justifying use of AM technology for a particular part, selecting the right process and material for the application in mind and ensuring it is designed with the advantages and considerations of AM in mind. The course is not intended to serve as a software-training class or as a deep dive into any specific AM process, but rather to draw connections between design and AM from a designer’s perspective.

LEARNING OBJECTIVES

By attending this seminar, you will be able to:

- List the different polymer and metal AM process technologies and materials and identify which of these are being used for functional part production
- Select the optimum AM material and process for a particular application
- Predict how design decisions impact manufacturability for the selected AM process and apply design rules and guidelines to your design process
- Quantify the expected properties of the AM parts you are designing
- Discover how topology optimization, cellular structures and other disruptive design techniques can be leveraged with AM and associated software tools
- Identify the different drivers for adopting AM for a particular part, with regard to cost, lead time, supply chain and performance risks
- Relate to the challenges and ongoing research efforts to be able to move forward with AM implementation in the presence of rapid change in the field
- Develop a comprehensive strategy to bring AM for functional part production into your organization that addresses both the benefits and impacts

WHO SHOULD ATTEND

Designers working in aerospace or ground vehicle chartered with designing next generation solutions, designing replacement parts, or designing tools used in the manufacturing process will benefit from this course.

One of the biggest challenges companies have is in getting their designers to embrace AM since most of the designers did NOT formally study AM and school curriculums are only now beginning to add courses in AM

CONTENT HIGHLIGHTS

- Additive Manufacturing Processes
 - Introduction to AM
 - Polymer AM
 - Other processes and trends
 - Functional parts case studies
- Processes, Constraints, and Considerations
 - Materials options & selection
 - Geometric, aesthetic, and conformance considerations
 - Key process concepts
- Introduction to Design for AM
 - The need for new design thinking with AM
 - Four levels of AM design
 - Introduction to software tools for AM
- Topology Optimization
 - The case for sustainable design
 - Introduction to optimization concepts
 - Material models
 - Manufacturability
- Cellular Structures
 - Biometric underpinnings
 - Classification
 - Modeling approaches
 - Demo with topology
- Build Preparation
 - Support fundamentals
 - Build preparation demos
- Implementing AM: A Practical Guide for Designers
 - Part selection for AM
 - Challenges
 - Successful AM adoption transition strategies
 - Resources
- Case Studies

INSTRUCTORS

Dhruv Bate

Senior Technologist, Phoenix Analysis & Design Technologies, Inc.
and

Rey Chu

Co-Founder, Phoenix Analysis & Design Technologies, Inc.

I.D.# WB1705

SCHEDULE

COMING IN EARLY 2018

FEES

FEES WILL BE AVAILABLE SHORTLY

2+, 90-MINUTE SESSIONS/1.0 CEUS

The complete course description and schedule will be available soon at: training.sae.org/webseminars/wb1705/

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NEW! MATERIALS SELECTION PROCESS FOR ENGINEERING DESIGNS



This web seminar covers the engineering process for selecting materials to use for components and joints within a product. Applying the process enables selection of materials that optimize product performance, reliability and cost, while helping keep projects on schedule. The topics covered include identifying materials selection criteria, selecting candidate materials, and evaluating materials to determine their suitability.

LEARNING OBJECTIVES

By attending this web seminar, you will be able to:

- Explain the steps for the materials selection process
- Describe the categories of product design requirements that must be considered for materials selection
- Identify materials selection criteria based on the product design requirements
- Explain how to identify potential materials to use for a component or joint
- Identify the evaluations needed to determine whether materials are suitable for an application

WHO SHOULD ATTEND

Design engineers who select materials for products and program engineers who plan product development schedules. The course will also be beneficial to engineering managers, program managers, and manufacturing engineers.

CONTENT HIGHLIGHTS

- Materials Selection Process Steps
- Iterative Process and Trade-offs
- Design Hierarchy Between Component Physical Construction and Materials
- Design Requirements Categories
- Identify Product, Sub-assembly, and Component Requirements for the Different Design Requirements Categories
- Identify Component Materials Selection Criteria
- Identify Potential Materials
- Risk Management
- Identify and Perform Tests to Evaluate Materials
- Determining if Materials Satisfy Selection Criteria

INSTRUCTOR

Michael Pfeifer

President, Industrial Metallurgists, LLC

Did you know that up to 70% of the cost to make a product is due to its materials? Therefore, getting the materials right will have a big impact on the success of a product.

I.D.# WB1520

SCHEDULE

Check the course web page for the most up-to-date information and schedule.

FEES

List: \$640

Members

Classic: \$576

Premium: \$544

Elite: \$512

FOUR, 2-HOUR SESSIONS/.8 CEUS

Get more information and register:
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BRAKE FRICTION MATERIALS: TESTING, QUALITY AND SELECTION



The choice of brake friction materials varies per application, but each must have the appropriate coefficient of friction and be able to disperse large amounts of heat without adversely effecting braking performance. This seminar will provide an introduction to brake lining raw materials and formulation, manufacturing, quality control and testing. The course covers the critical elements that must be reviewed before arriving at a lining selection decision. Different classes of friction material and their use will be defined.

LEARNING OBJECTIVES

By attending this seminar, you will be able to:

- Describe the principles of friction
- Define the basic elements of friction material formulations
- Identify the difference between OE and after-market friction materials
- Identify appropriate tests to distinguish the differences between friction materials
- Interpret friction material test results

WHO SHOULD ATTEND

Brake system designers, quality control auditors, product development engineers, application engineers, lab/bench/vehicle test technicians, managers/friction material sales and marketing will all gain valuable insight into this highly guarded industry.

CONTENT HIGHLIGHTS

- Principles of Friction Materials
- Lining Coefficient of Friction
- Formulation/Compounding Friction Material
- Manufacturing Friction Material
- General Asbestos/Non-asbestos Friction Material Characteristics
- Friction Material Testing
- Edge Code
- Bench & Vehicle Tests
- Wheel Dust Test
- Government Regulations
- OE and After-market Friction Material Lining Selection
- Issues Facing Friction Material Industries
- Workshop

INSTRUCTOR

Mohammad Vakili
Industry Consultant

This seminar will provide an introduction to brake lining raw materials and formulation, manufacturing, quality control and testing. The course covers the critical elements that must be reviewed before arriving at a lining selection decision.

I.D.# C1020

SCHEDULE

September 28, 2017

Orlando, Florida—*Held in conjunction with the SAE 2017 Brake Colloquium & Exhibition*

FEES

List: \$810

Members

Classic: \$729

Premium: \$689

Elite: \$648

ONE-DAY/65 CEUS

Get more information and register:
training.sae.org/seminars/c1020/

CORROSION ENGINEERING AND PREVENTION



This course focuses on corrosion prevention of metallic and alloy structures and non-metallic composites and hybrid materials. Recent challenges and opportunities in corrosion of advanced composites used in the automotive, aerospace, and marine industries as well as for underground structures for oil, gas, geothermal and tidal wave technologies is included. This course also covers most traditional and non-traditional tests for corrosion studies, including real-time characterization techniques and analysis of corrosion phenomenon and corrosion monitoring principles.

LEARNING OBJECTIVES

By attending this seminar, you will be able to:

- Describe the basic electrochemical concepts of various corrosion processes
- Articulate and utilize corrosion prevention strategies and estimate corrosion behavior of materials and components
- Describe the role of ion-diffusion, crystal structure, and grain size on corrosion of metals and alloys
- Design and engineer corrosion resistive components for different industries
- Define methods of corrosion protection and interpret corrosivity maps
- Perform standard corrosion tests, in-depth analyses of test results
- Define anodic/cathodic protections and coatings specifications for various components
- Formulate corrosion prevention coatings materials for metallic and non-metallic structures

WHO SHOULD ATTEND

Engineers working in the transportation industry interested in corrosion and corrosion prevention.

CONTENT HIGHLIGHTS

- Fundamentals of Corrosion and Corrosion Prevention
- Mechanisms and Prevention of Corrosion
- Corrosion Engineering and Coating Technologies
- Surface Coating Technologies for Corrosion Prevention
- Supply and Manufacturing of Corrosion Prevention Materials
- Corrosion and Corrosion Prevention of EVs and HEVs with Batteries, Supercapacitors and Fuel Cells

INSTRUCTOR

Gholam-Abbas Nazri

Technical Director of New Technologies, Frontier Applied Sciences and Technologies, LLC

All facets of the transportation industry experience significant issues with corrosion which results in billions of dollars of loss each year.

I.D.# C1217

SCHEDULE

October 12-13, 2017
Troy, Michigan

FEES

List: \$1,370

Members

Classic: \$1,233

Premium: \$1,165

Elite: \$1,096

TWO-DAYS/1.3 CEUS

Get more information and register:
training.sae.org/seminars/c1217/

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- Vehicle Noise Control
- Hybrid and Electric Vehicle
- Gasoline Engine Calibration
- Transmission

training.sae.org/academies



INTRODUCTION TO ADVANCED HIGH STRENGTH STEEL APPLICATIONS AND MANUFACTURING



This course reviews the definition and properties of Advanced High Strength Steels (AHSS) and covers several common applications in automotive body structures. In addition, key manufacturing areas including stamping and welding are addressed to demonstrate the increased challenges as compared to lower strength steel grades. Troubleshooting of typical engineering and production problems completes the seminar to leave attendees with tools to help design more robust engineering solutions to AHSS applications.

LEARNING OBJECTIVES

By attending this seminar, you will be able to:

- Define AHSS grades and describe general properties of AHSS
- Identify potential applications for AHSS
- Describe key manufacturing processing issues
- Assimilate tools for trouble shooting part issues

WHO SHOULD ATTEND

This course is designed for Automotive Body Engineers, Die Engineers, Designers, Manufacturing Plant Personnel, New Hires in the Steel Industry, Supervisors, Planners, and others who would like to decrease vehicle weight through the use of AHSS.

CONTENT HIGHLIGHTS

- Background/Overview of AHSS
- Product Applications and Design Considerations
- Stamping Tooling
- Die Try-Out
- Hot Stamping Overview
- Roll Forming
- Welding / Joining
- Case Studies

INSTRUCTORS

Jody N. Hall

Vice President of the Automotive Market,
Steel Market Development Institute

Advanced High Strength Steels (AHSS) are now commonly used in automotive body structural applications. The high strength of AHSS is attractive to reduce mass in the automotive body through reduction in thickness. Strength supports improvements in safety requirements so that mass increases are minimized.

I.D.# C1416

SCHEDULE

October 10-11, 2017
Troy, Michigan

FEES

List: \$1,370

Members

Classic: \$1,233

Premium: \$1,165

Elite: \$1,096

TWO-DAYS /1.3 CEUS

Get more information and register:
training.sae.org/seminars/c1416/

MATERIAL SELECTION AND TESTING FOR PLASTICS



Today's necessity for quickly delivering products to market limits product development time and leaves less room for error and 're-dos.' With so many plastic materials available, it is crucial that those involved in product design understand resin properties and how they affect part design and manufacturability. To help you make the best plastic choices the first time, this seminar provides an overview of polymer chemistry, explains the methods for testing properties of plastics and presents a method of systematic selection that will optimize your plastics material selection process.

LEARNING OBJECTIVES

By attending this seminar, you will be able to:

- Understand the properties of plastic materials
- Know what types of instruments are used in testing
- Demonstrate methods used to test the properties of plastic materials
- Possess the technical background necessary to select the optimum resin for a given application
- Apply measurements to the standards and specifications so the material and design meet an application's service requirements

WHO SHOULD ATTEND

Product and part designers, engineers, and engineering managers involved in the development of plastic parts. Specifically designed to enhance on-the-job effectiveness for professionals at all levels of plastics part development, this course will provide an invaluable foundation for selecting plastic materials and understanding their capabilities and limitations.

CONTENT HIGHLIGHTS

- Introduction to Plastic Materials
- Plastics-General Overview
- Polymer Chemistry Introduction/Review
- Process Related Property Variations
- Properties of Plastics
- Processing Properties
- Simple Plastics Materials Selection
- Typical Materials Selection Errors
- Plastics Materials Review

INSTRUCTOR

Robert G. Speirs

Associate Professor of Plastics Programs, Ferris State University

"The instructor presented the material in an enthusiastic and understandable way."

Susan Collet

Senior Principal Engineer, Materials
Toyota Technical Center USA, Inc.

I.D.# C0134

SCHEDULE

Upcoming dates are being scheduled for this course. Check the course web page for the most up-to-date information.

FEES

List: \$1,370

Members

Classic: \$1,233

Premium: \$1,165

Elite: \$1,096

TWO-DAYS/1.3 CEUS

Get more information and register:
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VEHICLE SOUND PACKAGE MATERIALS



This live web seminar provides a detailed understanding of the source - path-receiver relationship for developing appropriate sound package treatments in automobiles, commercial vehicles, and other transportation devices. The course provides a detailed overview of absorption, attenuation (barrier), and damping materials and how to evaluate their performances on material, component, and vehicle level applications. A significant portion of the course is spent addressing case studies demonstrating how properly designed sound package materials successfully address vehicle noise issues.

LEARNING OBJECTIVES

By connecting with this course, you will be able to:

- Identify various descriptors used in acoustics while working with sound package materials
- Identify three fundamentally different sound package materials that are used in the industry
- Explain how these materials work and how to improve their performance
- Describe how various measurements are made and why they are necessary on a material level, component level, and vehicle level
- Prescribe appropriate sound package materials for specific NVH issues
- Construct proper protocols for combining different sound package materials for different components so that the final vehicle meets the required acoustic target

WHO SHOULD ATTEND

Those new to the vehicle sound package area; also designed for OEM or supplier engineers and all roles involved with noise control materials and parts for various types of vehicles.

CONTENT HIGHLIGHTS

- Vehicle Noise Sources and Solutions
- The noise system - sources
- The noise control system using sound package materials
- Sound Package Material - Absorber, Barrier, Damper
- Component and Vehicle Level Noise Measurements

INSTRUCTOR

Pranab Saha

Co-Founder and Principal Consultant, Kolano and Saha Engineers, Inc.

“Relevant, realistic and informative.”

Md Zakir Ahmed

Sr. Manager - Process Engineering
Volkswagen India Pvt Ltd

I.D.# WB1204

SCHEDULE

Future dates may be scheduled for this course. Check the course web page for the most up-to-date schedule and information.

FEES

List: \$640

Members

Classic: \$576

Premium: \$544

Elite: \$512

FOUR, 2-HOUR SESSIONS/.8 CEUS

Get more information and register:
training.sae.org/webseminars/wb1204/

ACCESS THIS COURSE ONLINE AND ON DEMAND AS A WEB SEMINAR REPLAY

Web Seminar RePlays are audio/visual captures of the live web seminar. The course sessions are unedited to include the results of interactions with the live participants and to expedite course availability. A learning assessment is available at the end of the course to reinforce learning and retention and gauge your understanding of the topic.

I.D. # PD3312040N

FEES

See above

8-HOURS/ .8 CEUS

Get the complete course description online: training.sae.org/replays/pd331204on/

SOUND PACKAGE MATERIALS FOR VEHICLE NOISE CONTROL



This seminar provides a detailed and thorough analysis of three different classes of acoustical materials - namely absorbers, barriers, and dampers, how they are different from each other, and acoustical properties that materials should possess for optimum vehicle noise control. The instructor addresses new advances in acoustical materials. The seminar covers ways to evaluate the acoustical performance of these materials using different test methods. It starts with the fundamentals of NVH and sound quality related to sound package materials and discusses the importance of various noise sources that impact the development of sound package treatments in a vehicle.

LEARNING OBJECTIVES

By attending in this seminar, you will be able to:

- Identify various descriptors that are used in NVH and sound quality while working with sound package materials
- Recognize various noise sources and paths in a vehicle
- Identify three different classes of acoustical materials
- Describe ways that acoustical materials work and how they differ from each other
- Road map for vehicle sound package development
- Distinguish test methods used to evaluate the acoustical performance of material

WHO SHOULD ATTEND

Designed for OEM or supplier employees responsible for various noise activities such as design, evaluation, trouble-shooting, procuring, supplying, and/or manufacturing noise control treatments and parts.

CONTENT HIGHLIGHTS

- Fundamentals of NVH and Sound Quality
- Vehicles Noise Sources and Solutions
- Materials for Vehicle Noise Control
- Different Automotive Measurements

INSTRUCTOR

Pranab Saha

Co-Founder and Principal Consultant, Kolano and Saha Engineers, Inc.

“Perfect for anyone getting into acoustic materials selection.”

Timothy Sellis

Materials Engineer
Federal Mogul

I.D.# 92032

SCHEDULE

Future dates may be scheduled for this course. Check the course web page for the most up-to-date schedule and information.

FEES

List: \$1,370

Members

Classic: \$1,233

Premium: \$1,165

Elite: \$1,096

TWO-DAYS/1.3 CEUS

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Explore this series of on demand training courses covering metallurgy topics. Developed by Industrial Metallurgists, LLC and offered by SAE International to automotive engineers worldwide. This collection of courses teaches practical metallurgy concepts assisting with design and manufacturing decisions and addressing common problems. The courses are designed for design, manufacturing, and quality engineers but sourcing professionals and technicians could also benefit.

WHAT YOU WILL RECEIVE

- With each registration, you receive three-months of on demand access to the presentations
- Integrated knowledge checks to reinforce key concepts
- The downloadable course workbook
- Proof of participation as part of your transcript

SEE THE FULL COURSE LIST AT training.sae.org/metallurgy/

FAILURE ANALYSIS OF METALS

Quickly getting to the bottom of a metal failure is critical for preventing future failures, keeping customers happy, and keeping manufacturing lines running. This course will teach you how to perform failure analysis of fracture, corrosion, and manufacturing failures.

training.sae.org/metallurgy/pd261505on/

PRINCIPLES OF METALLURGY

This course teaches the basic microscopic structures present inside of metals, how they influence metal strength, and how these structures can be modified using common manufacturing processes to obtain specific mechanical properties. Several examples are presented to demonstrate how common alloying and manufacturing methods are used to modify the microscopic structures and properties of metals.

training.sae.org/metallurgy/pd261322on/

CORROSION OF METALS

The corrosion of metals is covered in this course. The physics of corrosion is explored as a background for the discussion of seven common types of corrosion. Learn why and how corrosion occurs and methods for controlling corrosion.

training.sae.org/metallurgy/pd261328on/

CORROSION OF METALS: CHEMISTRY OF CORROSION

This course covers the fundamental mechanisms involved in the aqueous (water based chemicals) corrosion of metals. The factors that influence the inherent corrosion behavior of a metal and the factors that influence metal corrosion rate will be discussed.

training.sae.org/metallurgy/pd261334on/

CORROSION OF METALS: GALVANIC CORROSION

Learn why and how galvanic corrosion occurs and methods for controlling it.

training.sae.org/metallurgy/pd261336on/

CORROSION OF METALS: UNIFORM CORROSION

Learn the how and why of uniform corrosion of metals—how it occurs and how to control it.

training.sae.org/metallurgy/pd261335on/

HARDNESS TESTING

This on demand course focuses on Rockwell and Brinell hardness testing and Vickers and Knoop microhardness testing. Learn how tests are performed, test sample requirements, test parameter selection, and testing requirements.

training.sae.org/metallurgy/pd261331on/

METALLURGY OF PRECIPITATION STRENGTHENING

This course teaches about the microscopic changes that take place in a precipitation strengthened alloy and the effects on the properties of the alloy. The effects of the different heat treating steps and heat treating process parameters on the alloy microstructure and the effects on alloy strength are discussed.

training.sae.org/metallurgy/pd261329on/

METALLURGY OF STEEL CASE HARDENING

This on demand course discusses common steel case hardening processes and how they are used to modify the surface layers of steels to obtain specific mechanical properties. Learn about process parameters and their affect on case composition, depth, microstructure, and properties.

training.sae.org/metallurgy/pd261333on/

METALLURGY OF STEEL THROUGH HARDENING

This course covers the metallurgy of steel through hardening processes. Learn about the effects of heat treating temperature and cooling rate on steel microstructure and properties, and the effects of the interaction between heat treating process parameters and steel composition on through hardened steel microstructure and strength.

training.sae.org/metallurgy/pd261330on/

METALLURGY OF STEEL: PRINCIPLES

Learn the phases and microstructures that form in steels, their effects on steel properties, the microstructure changes that occur when steel is heated and cooled, and the effects of carbon content and cooling rate on the microstructures that form in this course. All this information is applicable to understanding the effects of steel heat treating processes and heat treating process parameters on the microstructure and properties of heat treated plain carbon, low-alloy, and tool steels.

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BOOKS

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AUTOMOTIVE VEHICLE ASSEMBLY PROCESSES AND OPERATIONS MANAGEMENT

Proven technologies and processes are explored in this examination of modern automotive manufacturing. Fundamentals and applications, as well as new advances are discussed as the author bridges the gap between academic research and industrial practice.

STUDIES INTO ADDITIVE MANUFACTURING FOR IN-SPACE MANUFACTURING

In partnership with the National Space Grant Foundation and NASA, students from the University of Wisconsin-Milwaukee participated in the 2014-15 X-Hab Academic Innovation Challenge, with participants tasked with developing new AM solutions that would be recyclable with minimal loss in mechanical properties. The results of this project are now published by SAE International.

METALS & ALLOYS IN THE UNIFIED NUMBERING SYSTEM

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