Science and Technology of Materials, Interfaces, and Processing

AVS SHORT COURSE REGISTRATION FORM

Last Name:			**First Name:**	
Affiliation:				
Address:				
Telephone:				
Email:				
AVS Member	**YES**		**AVS Membership Number:**	
	NO			

Registration Deadline = March 9th, 2011

Course Title	Instructor	Date(s)	Amount	
An Overview of Applied Vacuum Technology	Dr. Bob Childs *MIT*	03/21/2011 03/22/2011	Member = **$625** Non-member = **$675** Student Member = **$200** Student = **$250**	
UHV Design and Practices	Dr. Ronald Outlaw *William & Mary*	03/29/2011	Member = **$425** Non-member = **$475** Student Member = **$125** Student = **$175**	
Partial Pressure Analysis	Mr. Stan Goldfarb *ExxusTech*	04/05/2011	Member = **$425** Non-member = **$475** Student Member = **$125** Student = **$175**	
			Total:	

Payment Information: Please make checks in the total amount payable to "AVS Prairie Chapter". Payment is due the morning of the course. Credit cards will not be accepted.

Course Registration Contact: Allan Rowe – arowe@fnal.gov; phone 630.840.4474; fax 630.840.8036

Registration Information:

AVS membership is not required to register for the short courses.

Non-Fermilab employee short course participation is limited to 10 students per course. Registration slots will be filled on a first-come-first-serve basis.

Send an electronic copy of your completed registration form to:

Allan Rowe -- arowe@fnal.gov; phone 630.840.4474

You will receive a confirmation response that your registration has been received. At the time your registration is received and all student slots are already reserved, you will be put on a waiting list. You will be informed of your registration status by March 10th, 2011.

Course Times and Location:

All AVS Short Courses will begin at 8:00 a.m. at the Fermilab Training Center (EAOC building). The training center is located on the east side of Road A northeast of Wilson Hall. A map of the Fermilab site can be found below. The second link is a view that shows the EAOC building across from the Meson Detector Building.

http://www.fnal.gov/pub/visiting/map/site.html

http://www.fnal.gov/pub/visiting/map/meson.html

Entry into Fermilab:

Please enter Fermilab at the main entrance at the intersection of Kirk Road and Pine Street on the west side of the Lab. You will not need special permission to enter Fermilab. When you arrive, a security guard will ask your onsite destination. Respond that you will be at the Fermilab Training Center and Wilson Hall. Ask for a site map if necessary.

Hosted by: Fermilab & AVS Prairie Chapter

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Course: An Overview of Applied Vacuum Technology

Course Objectives

- Be introduced to the fundamental concepts of vacuum technology.
- Learn about common vacuum system hardware and instrumentation, including pumps, gauges, flanges, valves, and feedthroughs.
- Understand applications and processes involving vacuum technology.
- Benefit from a "just right" two-day course (when you don't have the time or the need to attend a four- or five-day introductory course).

Course Description

The course begins with a definition of vacuum and a description of the physical conditions existing in a vacuum environment. Following this introduction will be a discussion of gases at low pressures and the interactions between gases and solids. The phenomena of gas flow though vacuum systems will then be examined. The primary components of vacuum systems, with an emphasis on pumps and gauges, will be described.

Requirements for materials compatible with the vacuum environment will be discussed. Various sealing techniques will be described, including coverage of all demountable flange systems in common use today. Common vacuum system configurations and operational procedures will be outlined. The course will finish with a description of vacuum leak detection methods and the far-reaching applications of vacuum technology today.

Ample time for questions and discussion will be scheduled. A comprehensive list of references will be provided for those wishing to learn more detailed information about specific areas. The emphasis of the course will be to provide practical information for individuals with minimal training in vacuum technology.

Who Should Attend?

Managers, technicians, engineers, and scientists who desire an introduction to the concepts, hardware, and instrumentation used in applied vacuum technology today. Those interested in a short review of vacuum basics will also find this course valuable.

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: Dr. Bob Childs, Massachusetts Institute of Technology

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Course: UHV Design and Practices

Course Objectives

- Understand the pump factors that limit ultimate pressure.
- Know the degassing methods that minimize the total outgassing rate.
- Learn how to measure total and partial pressures in UHV.
- Learn the operating methods necessary to maintain UHV.

Course Description
Ultrahigh vacuum (UHV) is a required environment for many research areas, such as surface science (which requires the use of electron, ion, and neutral spectroscopies), as well as for many technological areas, such as thin-film growth of electronic and optical materials. In this course, the techniques involved in the production, measurement, and operation of such pressure levels are discussed.

In addition to kinetic theory, system design elements--such as methods of pumping, materials selection, materials processing, outgassing considerations, system degassing, instrument degassing, surface effects, pressure-limiting factors, methods to shorten pumpdown time, and sample transfer systems--are reviewed. Special emphasis is given to total and partial pressure measurement within UHV systems. Various applications requiring an operational UHV environment are also discussed.

The course concludes with an open forum to exchange new ideas and techniques.

Who Should Attend?
Scientists, technicians, and others with a fundamental understanding of basic vacuum technology wishing to learn the techniques necessary to achieve UHV.

Instructor: Dr. Ronald Outlaw, Research Professor, College of William and Mary

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Course: Partial Pressure (RGA) Analysis

Course Objectives

- Learn how a residual gas analyzer (RGA) works
- Learn how to interpret RGA mass spectra

Course Description
This course provides the basics needed to analyze Residual Gas Analyzer (RGA) data. It begins at a very elementary level, first describing the atom, then proceeds to the atomic electronic structure, then on molecular bonds. The operation of an RGA is next described, especially phenomena that occur in the ion source. All this information is used in the discussion of RGA spectral interpretation. Typical RGA spectra are shown and analysis of the spectra is demonstrated. Relevant references, tables and graphs are presented.

Who Should Attend
Scientists, engineers and technicians who use or plan to use residual gas analyzers in research and support of high vacuum processes.

Instructor: Mr. Stan Goldfarb, ExxusTech

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INSTRUCTOR BIOGRAPHIES

Robert Childs began his 30 year career at the Massachusetts Institute of Technology in 1969 as an electronic technician in the Instrumentation Lab (Draper Lab) after completing his term of service in the US Air Force. There he assembled and tested miniature gyros for guidance systems used' on Poseidon Missiles and the Apollo Moon Mission. He quickly transferred to the Center for Space Research (CSR) the following year to begin work on the Lunar Surface Experiment that was one of the successful experiments of the Apollo 17 Mission, the last manned Moon mission of the Apollo Program. This experiment was used to map the Lunar surface for minerals and water using the Lunar Rover and a transmitter deployed as an interferometer system to look deep into the Lunar crust. The three-year development program took the team to various glacier fields around the world to test the prototype packages in an electrical environment large enough to represent the electrical properties of the Moon. With the successful completion of the Apollo Program at MIT Bob was asked by a professor who had seen his work to transfer to a new project that the professor was collaborating on.

Starting first on loan from CSR to the Bitter National Magnet Lab, Bob got involved in the construction of the first of three major Tokamak Reactor Experiments that would last from 1971 to the present Alcator CMOD. After a year he transferred to full time to this project and soon began his career in vacuum technology. As an electronic technician, he was given the task of building the vacuum pump control system for Alcator A. Tokamak. This naturally required an understanding what vacuum is all about and how the various pumps operated. Thus began his OJT and with the help of numerous professors and engineers in the lab and a series of AVS short courses he was on his way to a ner career. As time went on the project grew and as new technicians. were added Bob was put in a supervisory roll and was promoted to full staff as the technical supervisor of the Alcator Vacuum Lab. With the success of Alcator A came Alcator C and a whole new level of sophistication in vacuum technology and control. Bob was very much in charge of the design and construction of the vacuum vessel and pumping system for Alcator C. This experiment made international news when it produced the first high density plasma to achieve the Lawson Criteria for density necessary for ignition of a fusion reactor. This would not be possible without the: clean UHV environment produced by the Alcator C vacuum system. The Alcator program has been and is today the leader in producing the low Z effective plasmas necessary for fusion research. Alcator CMOD continues in this lead as one of only two major fusion projects in operation in the US funded by the Department of Energy.

Besides the work for the Alcator program Bob has been consulted by various other departments around MIT on vacuum issues. In addition, he found time to get involved in the High School Outreach program of the Plasma Science and Fusion Center by building the plasma demo device used to teach the students about plasma science. Three years ago Bob's service were loaned to another project in the PSFC that got involved constructing the world's largest superconducting magnet for the ITER Central Solenoid Model Coil. This international project is part of the design phase of a world class Tokamak that would demonstrate production of power equivalent to a power plant for an average size city. To make this work it would have a superconducting magnet system larger than anything built at this time. To prove it is possible the four world partners decided to construct a demonstration solenoid that would test the materials and construction techniques necessary to build the ITER Tokamak. In order for the materials to become superconducting, they had to be wound before the heat treat process. This meant the

coils would have to be reacted in a very large vacuum furnace. Wall Colmonoy, a company in Dayton, Ohio, had the facility and furnace that could be made large enough. With the addition of a state-of-the-art gas purging and data acquisition system designed and built by Bob, he and a technician spent the next two and a half years in Ohio performing the heat treatments one at a time. The twenty coils and one Japanese coil were successfully heat treated and for his dedication Bob was awarded a Certificate of Merit from the ITER Home Team. The Wall Comonoy Company even gave him a plaque to say how much they appreciated working with him.
Bob has been involved with the AVS for many years serving first on the Executive Committee of the Vacuum Technology Division as a Director and then Chair. From there he became the Chair of the Recommended Practices Committee and with the involvement of the RPC in ISO membership serves on the Technical Advisory Group for the ISO TC112 Vacuum Technology Standards Committee. He is the Vacuum Technology Delegate to IUVSTA and as such was elected the Vice Chairman of the Vacuum Science Division his first three years and now serves as Chairman for the next three years. He has served on numerous Program Committees for the National Symposium and Local Arrangement committees. He is on the Steering Committee for the AVS New England Chapter and has been an instructor for Vacuum Technology courses offered by the chapter.
As for non-work related activities, Bob has been involved with living history groups as a member of eight different units that reenact the American Revolution. He has done this for twenty five years and has traveled all over the world telling people about our struggle for independence and life in the 18th century.

Ron Outlaw is a Research Professor in Applied Science at the College of William and Mary in Williamsburg, Virginia, and was formerly a Senior Scientist at NASA, Langley Research Center. He received his doctorate in Materials Science at Virginia Tech and did post doctoral work at MIT. His early work was in UHV systems and gauge design, physical adsorption, metal hydride secondary standards, orbiting molecular shield concepts, space processing, thin film growth of semiconductor materials, hydrogen transport and UHV generation of atomic oxygen and hydrogen. Present work includes the development of advanced vacuum instrumentation and electron emission sources. He has published over 100 technical articles and holds six patents. He is a member of AVS.

Stanley Goldfarb received his BS in chemical engineering from CCNY. He has been an active member of the AVS since 1960. His experience at Veeco Instruments included Field Sales, Training Director, and the Applications Engineering Laboratory Manager. He moved to California in 1970 to join first Airco Temescal, then UTI as Sales and Marketing Manager. In 1977, he cofounded US, Inc., a sales and marketing organization serving the high-vacuum and thin-film markets and manufactured a small planar magnetron sputter source designed for research and development. Stanley founded Exxus in 1985. He has taught courses in vacuum technology, leak detection, total and partial pressure analysis for the AVS and many corporations.