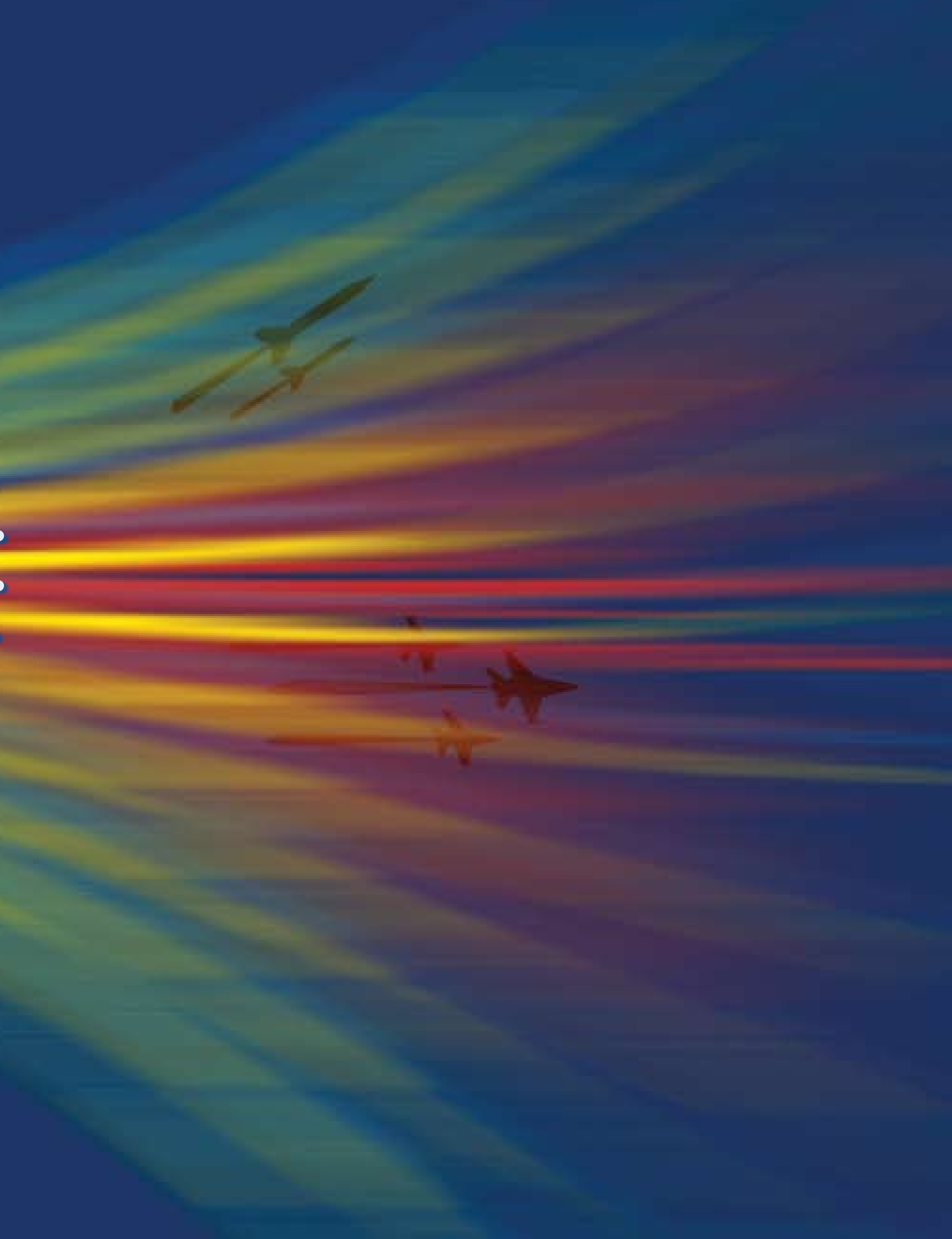
2010 Professional Development Catalog



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AIAA
The World's Forum for Aerospace Leadership

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Adaptive Structures

Adaptive Structures: Practice and Promise

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The last 20 years have seen significant advances in the general field of active/smart structures. These advances were driven by the need for higher specific performance, and were enabled by advances in transducer materials, electronics, and computing technology. This course will introduce participants to "smart" materials; to devices made using such materials; to the use of such devices as elements of adaptive structures; and to control strategies tailored to exploit the unique features of such materials and devices. The instructors will also present useful design information, including material figures-of-merit, modeling methods for adaptive structures, and example applications.

Key Topics

- Background and history
- Smart materials
- Sensor and actuator devices
- Adaptive structures and modeling
- Control of adaptive structures
- Applications to vehicle systems

Instructors

John P. Rodgers, Starboard Innovations, LLC
Greg P. Carman, UCLA

Tensegrity Systems

NEW

Scheduled

10–11 April 2010 • Orlando, FL
Held in conjunction with the 51st AIAA/ASME/ASCE/AHS/ASC Structures, the Structural Dynamics, and Materials Conference, the 18th AIAA/ASME/AHS Adaptive Structures Conference, the 12th AIAA Non-Deterministic Approaches Conference, the 11th AIAA Gossamer Systems Forum, and the 6th AIAA Multidisciplinary Design Optimization Specialist Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course is to provide the analytical machinery required to integrate structure and control design, and to show that this optimized structure usually has a finite, rather than an infinite, complexity. The first challenge is to choose the right paradigm for structure design. As opposed to a control system that torques or pushes the structure away from its equilibrium, a tensegrity paradigm for structures will allow one to modify the equilibrium of the structure to achieve the new desired shape, so that power is not required to hold the new shape. Integrating structure and control design will require less power from the control system to accomplish the same objectives. Less control power also impacts the parameters of structure design, since less structural stress is imparted to the structural components during control.

Key Topics

- The Tensegrity Paradigm
- Optimal Structures for Bending Loads
- Optimal Structures for Compressive Loads
- Deployable Wing Design
- Deployable Cantilevered Beam
- Nonlinear Control of Tensegrity Systems

Instructor

Robert Skelton, University of California, San Diego

Registration

	By 15 March 2010	After 15 March 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Aeroacoustics

Computational Aeroacoustics: Methods and Applications

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course examines the computational issues that are unique to aeroacoustics. CAA time marching algorithms that have minimal numerical dispersion and dissipation will be discussed. Radiation, inflow, and outflow boundary conditions as well as time-domain impedance boundary condition that are vital to a quality numerical solution of aeroacoustics problems are provided. Methods for nonlinear wave propagation, shock capturing and multi-scale acoustics problems are developed. Applications to a number of important aeroacoustics problems will also be presented.

Key Topics

- Computational issues unique to aeroacoustics
- Optimized time marching algorithms with minimal numerical dispersion and dissipation
- Radiation, inflow, and outflow numerical boundary conditions; time domain impedance boundary conditions
- Artificial selective damping
- Nonlinear wave propagation, shock capturing and multi-scale aeroacoustics problems
- Examples of applications to aircraft, automobile, and flow noise problems

Instructor

Christopher Tam, Florida State University

Phased Array Beamforming for Aeroacoustics

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course will present physical, mathematical, and some practical aspects of acoustic testing with the present generation of arrays and processing methods. The students will understand the capabilities and limitations of the technique, along with practical details. They will learn to design and calibrate arrays and run beamforming software, including several algorithms and flow corrections. Advanced techniques in frequency-domain and time-domain beamforming will be presented. The important topics of electronics hardware and software for data acquisition and storage are outside the scope of the course, apart from a general discussion of requirements.

Key Topics

- Gain an understanding of diagnostic techniques for measuring noise-source characteristics and how they may be applied to your projects
- Find out how advances in array technology can extend the capabilities of your existing facilities
- Learn how to apply these techniques for testing in a wide range of situations
- Become familiar with beamforming software

Instructor

Robert P. Dougherty, OptiNav, Inc.

Aerodynamic Measurement Technology

Modern Design of Experiments

Scheduled

26–27 June 2010 • Chicago, IL

Held in conjunction with the 27th AIAA Aerodynamics Measurement and Ground Testing Conference, the 28th AIAA Applied Aerodynamics Conference, the 5th Flow Control Conference, the 40th Fluid Dynamics Conference and Exhibit, the 10th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, and the 41st Plasmadynamics and Lasers Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

Aerospace researchers with considerable subject-matter expertise who have had relatively little formal training in the design of experiments are often unaware that research quality and productivity can be substantially improved through the design of an experiment. Reductions in cycle time by factors of two or more in real-world aerospace research programs, with quality improvements of that same order, have resulted from the application of fundamental experiment design techniques taught in this course. Examples drawn from specific studies will quantitatively illustrate resource savings, quality improvements, and enhanced insights that well-designed experiments have delivered in various university, government, and industry aerospace programs. Computer software CDs included with the course (Design Expert) will be demonstrated.

Key Topics

- Key advantages of the Modern Design of Experiments (MDOE) over classical (conventional) experiment design methods
- How to specify the proper volume of data to enhance the probability of success and to avoid wasting resources
- Full and fractional factorial designs to efficiently quantify main effects and interactions
- Introduction to response surface methods
- Illustration of experiment design computer software (Design Expert)

Instructor

Richard DeLoach, NASA Langley Research Center

Registration

	By 31 May 2010	After 31 May 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Pressure and Temperature Sensitive Paint

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This is a course on the fundamental principles and applications of pressure sensitive paint (PSP) and temperature sensitive paint (TSP). Compared with conventional techniques, PSP and TSP offer a unique capability for non-contact, full-field measurements of surface pressure and temperature on complex aerodynamic models with a much higher spatial resolution and a lower cost.

Key Topics

- Photophysical models of PSP and TSP
- System analysis and data processing
- Uncertainty analysis
- Applications of PSP and TSP in wind tunnels, rotating machinery, and flight tests

Instructors

John Sullivan, Purdue University
Tianshu Liu, NASA Langley Research Center
Keisuke Asai, National Aerospace Laboratory

Aerospace Power Systems

Hydrogen Safety Course

NEW

Scheduled

29–30 July 2010 • Nashville, TN

Held in conjunction with the 46th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

The Hydrogen Safety Course is intended to provide the student with a working knowledge of safety issues associated with the use of hydrogen. Using the aerospace industry standard, *Guide to Safety of Hydrogen and Hydrogen Systems*, AIAA G-095-2004, this course presents basic safety philosophy and principles and reviews a practical set of guidelines for safe hydrogen use. The information presented in this course is intended as a reference to hydrogen systems design and operations and handling practices; users are encouraged to assess their individual programs and develop additional requirements as needed. The course focuses primarily on aerospace applications, but other uses are also covered.

Key Topics

- Properties of hydrogen related to safety
- Identify and evaluate hazards in a hydrogen system
- Understand the methods for addressing hazards in hydrogen systems

- Safe practices in design, materials selection, and operation of a hydrogen system
- Proper responses to emergency situations involving hydrogen

Instructors

Stephen Woods, NASA
Steve McDougle, NASA

Registration

	By 28 June 2010	After 28 June 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Spacecraft Power System Design

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course is designed to illustrate the multidisciplinary issues that must be considered in the systems engineering of a spacecraft electrical power system. Tailored for those new to the field, as well as experienced workers in related technologies, the course provides an overview of spacecraft power system design principles and processes, as well as component design approaches and technology alternatives. It includes information on solar array, energy storage, and power conditioning components in use today, and new technologies that are under development. While the primary focus of the course is on photovoltaic/battery power systems, other alternatives such as nuclear and radioisotope systems, solar thermal power systems, flywheels, and fuel cells will also be described. Processes for system engineering of the power system include the driving requirements that define the system and how to use these to develop the power system architecture.

Key Topics

- System design considerations
- Power system architectures
- System design techniques
- Solar arrays
- Energy storage devices
- Alternate power systems

Instructors

Theodore G. Stern, Composite Optics Inc
Douglas Rusta, Consultant
Douglas M. Allen, Schafer Corporation
Robert J. Pinkerton, Spectrum Astro

Air Breathing Propulsion

Air Breathing Propulsion Design

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course is designed to give an overview of air breathing propulsion design topics: fundamentals of gas turbine engines, inlets and exhaust systems, engine performance, engine aircraft integration and power plant systems, and ramjets and scramjets. This course emphasizes the conveyance of a basic understanding of the subject topics to the student. The course was developed with the support and sponsorship of the AIAA Air Breathing Propulsion Technical Committee.

Key Topics

- Gas turbine engine theory and operation
- Inlets and exhaust systems
- Engine performance
- Engine aircraft integration and power plant systems
- Ramjets and scramjets

This course is organized under the auspices of the AIAA Air Breathing Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

Ian Halliwell, Avetec Inc.

Air Breathing Pulse Detonation Engine Technology

Scheduled

NEW

29–30 July 2010 • Nashville, TN
Held in conjunction with the 46th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

The PDE Technology short course is designed to present a comprehensive overview of air-breathing Pulse Detonation Engines, including detonation combustion theory, performance metrics, fuels and initiation systems, detonation physics research, technical challenges, and opportunities for development of PDEs. This course will be taught by instructors who are renowned experts from government and industrial organizations actively engaged in PDE propulsion R&D. They will discuss state of the art, challenges, and development trends of this exciting propulsion technology.

Key Topics

- Physics of Detonation Combustion
- PDE Propulsion Options and Combined Cycles
- Cycle Analysis and Performance Metrics
- Design and Development of PDE Components and Subsystems
- Numerical Simulation and CFD Analytical Predictions
- PDE/Vehicle Integration Approaches

Instructor

D. E. Musielak, ATK Tactical Propulsion and Controls

Registration

	By 28 June 2010	After 28 June 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Combustion Instabilities in Air Breathing and Rocket Propulsion Systems

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course is intended to provide the background and technical foundation for understanding, modeling, and mitigating combustion instabilities in all types of chemical propulsion systems. These include air breathing engines (gas turbines, augmenters, and ramjets and scramjets) and rocket motors (liquid and solid propellant engines).

Key Topics

- Historical Review of Combustion Instabilities in Various Practical Systems
- Fundamental Processes and Mechanisms for Driving Instabilities
- Laboratory Observations and Diagnostics of Instabilities
- Modeling and Simulations, including Analytical and Numerical Models
- Control of Instabilities, including Passive and Active Techniques

Instructors

Vigor Yang, Pennsylvania State University
Tim Lieuwen, Georgia Institute of Technology

Aircraft Design

Aircraft Conceptual Design

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This popular course has been attended by over 2500 engineers and offers a broad overview of the entire subject of aircraft conceptual design, from initial sizing and design layout to design analysis, optimization, and trade studies. All required theoretical methods are covered in the course, but the biggest strength of the course is that it provides a "real-world" insight into the actual practice of aircraft design. Special topics of interest include stealth design, UAV, VSTOL and helicopter design, derivative aircraft design, design optimization and carpet plotting, and use of CAD in conceptual design.

Key Topics

- Developing a design concept in response to requirements
- Laying out the design on a drafting table or CAD screen
- Analyzing it for aerodynamics, propulsion, structure, weights, stability, cost, and performance, then calculation of range or sizing the design to a specified mission
- Trade studies, carpet plots, and multivariable optimization
- Discussion of helicopter, VSTOL, UAV, and novel design concepts
- Overview of CAD as used in aircraft conceptual design

Instructor

Daniel P. Raymer, Conceptual Research

Fundamentals of Aircraft Performance and Design

Scheduled

1 February 2010–31 July 2010

Course Synopsis

Why do aircraft look and fly the way they do? This course will give you an introduction to the major performance and design characteristics of conventional, primarily subsonic, aircraft. At the end of the course, you will be able to use the physical characteristics of an existing aircraft to determine both its performance for specified flight conditions and the flight conditions for best performance. You will also be able to take a set of operational requirements and constraints and perform a feasibility design of an aircraft that should satisfy both the requirements and constraints. The emphasis is on simple analytical relationships that are applicable to classes of aircraft rather than on the traditional graphical techniques applied to a specific individual aircraft with a specified weight. A calculator is all you will need to solve the problems, but you are free to use a computer if you desire.

Key Topics

- Maximization of range for a given payload and fuel load
- Preliminary design of aircraft to meet mission requirements
- Descent of gliders and sailplanes or aircraft with power failure
- Best turning flight conditions
- Propulsion system characteristics and differences
- Recognition of aircraft characteristics and their significance

Instructor

Francis Joseph Hale, North Carolina State University

Registration

	By 1 January 2010	After 1 January 2010
AIAA Member	$1095	$1200
Nonmember	$1195	$1300

Air Transportation Systems

Safety Management Systems for the Aerospace Industry

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course provides the basic doctrine and practical guidelines for the application of Safety Management Systems (SMS) throughout the aerospace industry. The SMS approach stresses the practice of managing safety with a process oriented system safety approach emphasizing not only the application of strict and comprehensive technical standards, but also the effective application of management systems that ensure risk management and safety assurance. This SMS doctrine applies to products and service life cycles in all areas of the aerospace system such as the design, manufacture, testing, operation, maintenance, and management of all kinds of air and space vehicle systems and components.

Key Topics

- The need for an SMS in the Aerospace industry
- Safety and Quality
- SMS Principles

- Safety-Risk Management
- Safety Assurance – Safety Promotion
- Applications in Aeronautics, Space, Satellite design and operation

Instructor

Guido Fuentes, Avianca Airlines

Applied Aerodynamics

Applications of Microfluidics

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This short course will start with a consideration of the fundamentals of intermolecular forces and proceed to a consideration of where continuum assumptions are valid and where they are not. Scaling phenomena and flow physics will be discussed, such as the relative importance of surface tension and drag as system size becomes smaller. The breakdown of continuum behavior will be discussed, and the utility of computational simulations in studying continuum breakdown will be presented. A short introduction to electrokinetics will be provided. Also, an introduction to the techniques used to fabricate microfluidic MEMS will be given. Then experimental techniques suitable for micro/nano flows will be presented. Aeronautical applications of microfluidics will be discussed with special attention paid to microscale flow control.

Key Topics

- Flow physics in small but continuum flows
- Flow physics in microdevices
- Sub-continuum fluids behavior
- Microscale experimental diagnostics
- Aero applications of microfluidics
- Flow control at microscopic length-scales

Instructors

Steve Wereley, Purdue University
Mohamed Gad-el-Hak, Virginia Commonwealth University

Computational Methods in Aeroelasticity

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course provides an introduction to numerical methods used in aeroelasticity. Topics include the finite element method for simulating structural dynamics, interpolation methods for transferring mode shapes from structural mesh to aerodynamic mesh, doublet lattice method used in unsteady aerodynamics, and methods for reducing the order of computational models when using more computationally intensive methods for solving full potential or Navier-Stokes equations. Techniques include Rational Function Approximation (RFA), p-Transform, Karhunen-Loeve (KL) method, and Eigensystem Realization Algorithm (ERA). Emphasis will be given on how to reduce computational cost while running CFD codes and couple the aerodynamic and structural models for open and closed-loop analyses. Techniques will be introduced to extract aeroelastic characteristics such as V-g plots in the continuous as well as discrete time domain. Some of the most recent developments and research trends will be covered including analysis of nonlinear Limit Cycle Oscillation (LCO) and uncertainty analysis.

Key Topics

- Introduction of basic concepts.
- Interpolating structural modes to an aerodynamic mesh
- Linear unsteady aerodynamic tools: Strip Theory, Vortex Lattice, and Doublet Lattice methods
- Application of CFD for transonic nonlinear flow
- Model reduction methods used in aeroelastic formulation
- Nonlinearity and uncertainty analysis in aeroelasticity.

Instructors

Dr. T. Kim, The Boeing Company
Gautam SenGupta, The Boeing Company
Frode Engelsen, The Boeing Company

Atmospheric Flight Mechanics

Flight Vehicle System Identification in Time Domain

Schedule

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The scope of application of system identification methods has increased dramatically during the last decade. The advances in modeling and parameter estimation techniques have paved the way to address highly complex, large scale and high fidelity modeling problems. The objective of this two-day course is to review the recent advances in the time-domain methods of system identification from flight data, both from the theoretical and practical viewpoints. Starting from the fundamentals, a systematic approach will be presented to arrive at the solution. Benefits derived from flight validated models applying system identification will be highlighted. The course will provide an overview of key methods of parameter estimation in time domain, cover many examples covering both fixed-wing and helicopter applications, and address model validation in both time and frequency domain. The course will be supplemented with an overview of software tools available.

Key Topics

- Parameter estimation, consistency checking, and aerodynamic database validation methodology
- Insight and familiarity with modern time domain techniques and intricacies
- Large scale systems and high fidelity modeling

- Real world problems and possible solutions
- Demonstration of MATLAB based software tool and hand-on experience with test cases
- Establishment of contact with leading organization with vast practical experience

Instructor

Ravindra Jategaonkar, DLR Institute of Flight Systems

Modeling Flight Dynamics with Tensors

Scheduled

8–9 January 2010 • Orlando, FL

Held in conjunction with the 48th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition

***FREE CONFERENCE REGISTRATION**

Course Synopsis

Establishing a new trend in flight dynamics, this two-day course introduces you to the modeling of flight dynamics with tensors. Instead of using the classical "vector mechanics" technique, the kinematics and dynamics of aerospace vehicles are formulated by Cartesian tensors that are invariant under time-dependent coordinate transformations. This course builds on your general understanding of flight mechanics, but requires no prior knowledge of tensors. It introduces Cartesian tensors, reviews coordinate systems, formulates tensorial kinematics, and applies Newton's and Euler's laws to build the general six degrees of freedom equations of motion. For stability and control applications, the perturbation equations are derived with their linear and nonlinear aerodynamic derivatives. After taking the course you will have an appreciation of the powerful new "tensor flight dynamics," and you should be able to model the dynamics of your own aerospace vehicle.

Key Topics

- Introduction to modeling with Cartesian tensors
- Coordinate systems of flight dynamics
- Tensorial kinematics and dynamics of aerospace vehicles
- Six degrees of freedom equations of motion
- Perturbation equations of steady and unsteady flight
- Linear and nonlinear aerodynamic derivatives

Instructor

Peter H. Zipfel, University of Florida

Registration

	By 11 December 2009	After 11 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Pilot-Induced Oscillations: From the Wright Flyer to Fly-by-Wire

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

PIOs have occurred on just about every type and size of air vehicle since the Wright Flyer. They continue to be reported in initial flight test through full-scale operation. This course will describe the causes of PIO, including a review of the characteristics of the pilot as an integral element in PIO. It will rely heavily on documented events in the past to illustrate the insidious nature of PIO. Extensive use will be made of visual materials, including videos of some famous (and some not-so-famous) PIOs. The course will culminate with the opportunity for every attendee to experience PIO using a desktop simulator.

Key Topics

- A brief history of PIO
- Pilot dynamics and rating scales
- Categories and causes of PIO
- Prevention of PIO by design: Criteria for prediction
- Prevention of PIO real-time: Methods for detection and prevention
- Pilot rating scales, legal issues, FAA and JAA requirements

Instructors

David G. Mitchell, Hoh Aeronautics, Inc.
David Klyde, Systems Technology, Inc.

System Identification Applied to Aircraft–Theory and Practice

Scheduled

31 July 2010–1 August 2010 • Toronto, Ontario, Canada

Held in conjunction with the AIAA Guidance Navigation and Control Conference, the AIAA Modeling and Simulation Technologies Conference, the AIAA Atmospheric Flight Mechanics Conference, the AIAA Astrodynamics Specialist Conference, and the AIAA Atmospheric Space Environments Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course teaches the theory and practice of Aircraft System Identification, which involves building mathematical models for aircraft dynamics based on measured flight data. Results are useful for flight simulation, comparisons with CFD and wind tunnel results, flight envelope expansion, control system design, flying qualities analysis, and more. The course includes relevant theory and background, but focuses mainly on practical approaches and solutions. All aspects of aircraft system identification are included—experiment design, instrumentation, data analysis, modeling, and validation. All students receive a textbook and MATLAB® software. The software implements a wide variety of tools used at NASA Langley to solve aircraft system identification problems. The software tools are explained in detail in the textbook and discussed in the course. The course also includes practical hands-on experience, allowing students to become familiar with the use of the software on real flight data and to interpret results.

Key Topics

- Background and introduction
- Mathematical models for aircraft
- Modeling in the time and frequency domains
- Experiment design, instrumentation, and data handling
- System IDentification Programs for AirCraft (SIDPAC)—MATLAB® Software
- Hands-on practical experience

Instructor

Eugene A. Morelli, NASA Langley Research Center

Registration

	By 5 July 2010	After 5 July 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Computational Fluid Dynamics

CFD for Combustion Modeling

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The objective of the course is to provide the interested combustion engineer or researcher with the fundamentals of combustion modeling to assess a combustion problem and to decide on the adequate models to be used in numerical simulations. The course is designed to also provide the knowledge to implement certain models into CFD codes. The course starts with fundamentals of combustion chemistry and includes a hands-on introduction to a 0D/1D combustion code. This is followed by a brief introduction to statistical models and turbulence modeling. A comparative overview of the most commonly used combustion models will be given next. Implementation issues and application examples will be discussed. Special topics include combustion instabilities, combustion in aircraft engines, and high-speed combustion.

Key Topics

- CFD for Turbulence
- Chemical Kinetics Modeling
- CFD approaches for Turbulent Combustion
- Modeling for Turbulent Combustion
- Emission and Instability Modeling
- Application to Gas Turbines and Scramjets

Instructors

Suresh Menon, Georgia Institute of Technology
Heinz Pitsch, Stanford University

Computational Multiphase Flow

Scheduled

8–9 January 2010 • Orlando, FL
Held in conjunction with the 48th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition
***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course will include a survey of multiphase flow computational fluid dynamics, with particular attention to turbulent flows. This will include comparison of various "tools" (numerical methods) in terms of "performance" (accuracy with respect to specific predicted characteristics) and "cost" (required computational resources). The course will first examine multiphase applications, fluid physics, models, and governing equations. This will be followed by an overview of numerical methods as a function of flow conditions and desired results. Detailed discussion of the numerical approaches will be discussed in order of increasing particle size ranging from mixed-fluid and Fast Eulerian for small particles to point-force techniques for non-equilibrium intermediate-size particles, to resolved-surface techniques for large particles.

Key Topics

- Applications, Fluid Physics, Models and Governing Equations
- Overview of Numerical Methods in terms of Performance and Cost
- Mixed-Fluid and Fast Eulerian Methods
- Advanced Techniques for Point Forces Methods with Coupling
- Resolved-Surface Methods via Body-Fitted Grids and Smooth Interfaces

Instructors

S. Balachandar, University of Florida
Eric Loth, University of Illinois
Kyle Quires, Arizona State University

Registration

	By 11 December 2009	After 11 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Computational Thermal Analysis

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The present CHT course provides a singular focus on the thermal analysis process, providing a unique perspective by developing all concepts with practical examples. It is a computational course dedicated to heat transfer. In the treatment of the general purpose advection-diffusion (AD) equation, the course material provides a strong introductory basis in CFD. The present course attempts to couple both the computational theory and practice by introducing a multistep modelling paradigm from which to base thermal analysis. The seven lectures form a close parallel with the modelling paradigm to further ingrain the concepts. The present CHT course is also designed around an array of practical examples and employs real-time InterLab sessions. The overall goal of the CHT course is to form a hybrid unison of theory and practice, emphasizing a definitive structure to the analysis process.

Key Topics

- Formulation of the basic equations of heat transfer
- Decoupling systems and deriving boundary conditions
- Discretization of the governing equations and geometry
- Computational solutions to the discrete equation
- Validation of computational models and solutions
- Special topics in heat transfer

Instructor

Dean S. Schrage, TITAN Algorithms

Fundamentals of Computational Fluid Dynamics

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Computational algorithms for the solution of partial differential equations governing fluid motion are evolving on a parallel track with the rapid advancements in computer technology. Computational methods are of particular interest to engineers and scientists who must solve the governing equations, which in most cases lack analytical solutions. In the past few years, tremendous advances in computational algorithms have been made. Now it is possible to solve complex flow fields around sophisticated configurations such as the space shuttle orbiter, the hypersonic aerospace plane, and a variety of re-entry vehicles and complex internal flows. The technology is used extensively by mechanical, civil, aerospace, chemical, and petroleum engineers.

Key Topics

- Improve your understanding of various aspects of computational fluid dynamics, its limitations, and advantages
- Become familiar with the transformation of the equations of fluid motion from physical space to computational space and numerical algorithms for the solution of Euler and Navier-Stokes equations
- Improve your understanding of turbulence and turbulence models
- Learn about the different categories of turbulence models and the advantages and disadvantages of each category
- Learn to develop numerical schemes for solution of turbulence models

Instructor

Klaus A. Hoffmann, Wichita State University

Design Engineering

Advanced Composite Structures

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Advanced composites are critical, and in many instances enabling, materials for a large and increasing number of aerospace applications. Historically considered primarily structural and thermal protection materials, they also have great potential in virtually all subsystems, including propulsion, mechanisms, electronics, power, and thermal management. Physical properties are increasingly important. For example, composites with low densities, low CTEs and thermal conductivities higher than copper are now in production. In this short course we consider key aspects of the four key classes of composites, including properties, manufacturing methods, design, analysis, lessons learned and applications. We also consider future directions, including nanocomposites.

Key Topics

- Introduction to composite materials
- Basic characteristics of composite materials
- Test methods for composite properties
- Properties of Polymer Matrix Composites (PMCs), Metal Matrix Composites (MMCs), Carbon Matrix Composites (CAMCs) and Ceramic Matrix Composites (CMCs); Thermal Management Materials
- Design and analysis
- Lessons learned and future developments

Instructor

Carl Zweben, Consultant

Electro-Optical Systems for Aerospace Sensing Applications

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course will provide an introduction to electro-optical systems for practicing aerospace engineers. It is oriented towards non-specialists in electro-optics, such as systems engineers, specialists in related disciplines (such as computer/software, electrical, and mission planning), as well as other who must integrate and interact with EO payloads. It will cover basic EO design principles, methods for predicting and assessing performance, and current topical applications for airborne, ground-based, and space-based EO systems.

Key Topics

- Introduction to EO and optical systems concepts
- Performance metrics and design rules-of-thumb
- Sensors and image processing for EO systems
- Ground-sensing EO technologies and applications
- Air- and space-based EO technologies and applications

Instructors

Jeffrey Puschell, Raytheon Space and Airborne Systems
Timothy Howard, Boeing–SVS
Clay Carson, Raytheon Network Centric Systems

Economics

Economics of Space Transportation

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Lowering the cost of space transportation, although widely perceived as necessary, has proven intractable as a technical problem: after four decades' effort, the cost of space travel remains essentially unchanged. In this course we will develop a formal methodology which relates the cost of space launch to the underlying physics. Using this tool, we will show that lowering the cost of space transportation is largely immune to technical solutions; rather, we will find that the present high cost of space travel is a consequence of economic issues that will have to be addressed before any significant lowering of the cost of space transportation can occur.

Key Topics

- The cost of access to space: Why space travel is expensive
- The market in space transportation: How economic issues prevent lower cost
- The role of government: Untying the knot

Instructor

William R. Claybaugh, II, NASA Goddard Space Flight Center

Electric Propulsion

Electric Propulsion for Space Systems

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Over 120 spacecraft presently use electric thruster systems for primary or auxiliary propulsion. Electric thrusters are now being used to provide most of the post-LEO propulsion demands for both geosynchronous and deep space missions. The availability of practical, high-specific-impulse electric thrusters with long life, and the development of electrical power-systems required to sustain them, has resulted in extremely rapid growth in the applications of this technology. This course describes the fundamental operating principles, performance characteristics and design features of state-of-the-art systems in each of the three classes of electric thrusters (electrothermal, electromagnetic and electrostatic). The impacts of the thruster performance and life on mission planning; mission analysis techniques; and on-board spacecraft systems will be addressed. The extension of spacecraft capabilities afforded by electric propulsion and issues associated with its integration into spacecraft will also be discussed.

Key Topics

- Learn principles of operation of electric thrusters
- Understand when and why electric thrusters should be used
- Understand lessons learned from mission studies and flight experience

This course is organized under the auspices of the AIAA Electric Propulsion Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

Dan Goebel, NASA JPL

Fluid Dynamics

Advanced Computational Fluid Dynamics

Scheduled

1 December 2009–30 April 2010
1 December 2010–30 April 2011

Course Synopsis

The aim of this course is to extend the concepts of numerical schemes to a system of equations typically expressed in a vector form. The content of this course is equivalent to a one-semester graduate course. Furthermore, you must have had an introductory course in CFD, e.g., the AIAA Introduction to Computational Fluid Dynamics Course. Access to a high-end PC, workstation, or a mainframe computer, along with a FORTRAN compiler and graphics, is necessary for applications. This comprehensive course will prepare you for a career in the rapidly expanding field of computational fluid dynamics and fluid turbulence.

Key Topics

- Improve your understanding of various aspects of computational fluid dynamics, its limitations and advantages
- Become familiar with the transformation of the equations of fluid motion from physical space to computational space and numerical algorithms for the solution of Euler, parabolized Navier-Stokes, and Navier-Stokes equations
- Learn the fundamentals of the unstructured grids and finite volume schemes

Instructor

Klaus A. Hoffmann, Wichita State University

Registration

	By 1 November 2009	After 1 November 2009
AIAA Member	$1145	$1250
Nonmember	$1245	$1350
	By 1 November 2010	**After 1 November 2010**
AIAA Member	$1190	$1300
Nonmember	$1290	$1400

Application of High Order Accurate CFD Methods in Aerodynamics

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The objective of this course is to provide an introduction to the currently available high-order accurate methods in CFD, as well as to provide a discussion of potential benefits from their application for certain classes of aerodynamic applications, such as rotor aerodynamics and compressible flow LES, where low numerical diffusion and high resolution are key requirements. The first day will be devoted to the introductory discussion and presentation of the main features of available high-order methods suitable for aerodynamic applications. During the second day, the presentation of newly developed methods, such as the discontinuous Galerkin and the spectral volume methods, will be completed and multidimensional applications of the methods will be covered, comparisons of the methods will be presented, and simple applications of the methods will be demonstrated.

Key Topics

- Introduction to high-order accurate method and time integration methods
- High-order accurate centered finite-difference methods
- High-order accurate finite-volume methods
- ENO and WENO schemes
- High-order accurate finite-element methods and the discontinuous Galerkin method
- Spectral volume method

Instructor

John A. Ekaterinaris, FORTH/IACM

Computational Fluid Turbulence

Scheduled

1 December 2009–30 April 2010
1 December 2010–30 April 2011

Course Synopsis

A course in intermediate/advanced CFD and a course in fluid mechanics at upper division undergraduate or graduate level are required. Access to a high-end PC, a workstation, or mainframe computer, along with a FORTRAN compiler and graphics package, is necessary for applications. This comprehensive, three-part series of courses will prepare you for a career in the rapidly expanding field of computational fluid dynamics and fluid turbulence. Completion of these three courses will give you the equivalent of one semester of undergraduate and two semesters of graduate work. The courses are supported extensively with textbooks, computer programs, and user manuals. You can use the computer programs to develop your own codes, or you may modify the existing codes for assigned applications.

Key Topics

- Improve you understanding of turbulence and turbulence models
- Learn about the different categories of turbulence models and the advantages and disadvantages of each category
- Learn to develop numerical schemes for solution of turbulence models
- Learn the fundamental aspects of large eddy simulation (LES) and direct numerical simulation (DNS)

Instructor

Klaus A. Hoffmann, Wichita State University

Registration

	By 1 November 2009	After 1 November 2009
AIAA Member	$1195	$1300
Nonmember	$1295	$1400
	By 1 November 2010	**After 1 November 2010**
AIAA Member	$1245	$1350
Nonmember	$1345	$1450

Effective Use of the CFD General Notation System (CGNS) for Commercial and Research Applications

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

CFD General Notation System (CGNS) has developed into a popular standard for the storage and exchange of CFD data in the aerospace community and is now an AIAA Recommended Practice. The use of this standard allows a compatible application or user to communicate CFD setup and information to or from other third-party CFD tools including mesh generators, solvers, and post-processors. This course will introduce the participants to CGNS, the data format, the standard, and the software implementing the standard. Additionally participants will be provided comprehensive information for integrating CGNS into their applications. Examples will include implementation scenarios in sample academic or commercial applications and cover CFD data including structured and unstructured grids, solution data, governing equations, and boundary conditions. Participants will also have the opportunity to introduce their own sample applications for guidance on how to integrate and make use of CGNS for data storage or interchange.

Key Topics

- Introduction to CGNS–standard and software
- CGNS Standard–The Standard Interface Data Structure (SIDS)
- Implementing CGNS–The Mid-Level Library
- The CGNS Data Format
- Example CGNS Implementation
- Sample applications

Instructors

Christopher Rumsey, NASA Langley Research Center
Marc Poinot, ONERA-MFE/DSNA/ELSA
Thomas Hauser, Center for High Performance Computing
Bruce Wedan, ANSYS, Inc

Ken Alabi, Thaerocomp Technical Corporation

Flow Control for Specialists

Scheduled

UPDATED!

8–9 January 2010 • Orlando, FL
Held in conjunction with the 48th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition

***FREE CONFERENCE REGISTRATION**

Course Synopsis

The techniques of active flow control are becoming more sophisticated as fluid dynamics, control, and dynamical systems theory merge to design control architectures capable of solving challenging flow control applications. The two-day course will examine advanced topics in active flow control, placing particular emphasis on "how to do flow control." This course complements the AIAA Modern Flow Control I Short Course, but Flow Control I is not a prerequisite. A brief history of flow control, modern dynamical systems, and control theory related to closed-loop flow control and performance limitations will be discussed. State-of-the-art actuator and sensor design techniques will be covered. Case studies will be presented that describe recent success stories about the implementation of active flow control on advanced aircraft. The course lecturers, coming from industry and academia, have extensive backgrounds in flow control.

Key Topics

- Defining control objectives
- Modern flow control theory
- Actuator and sensor design and placement
- Algorithm selection and performance limitations
- Dynamical systems modeling
- Case studies

This course is organized under the auspices of the AIAA Fluid Dynamics Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

David Williams, Illinois Institute of Technology

Registration

	By 11 December 2009	After 11 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Fluid-Structure Interaction

Scheduled

8–9 January 2010 • Orlando, FL
Held in conjunction with the 48th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition

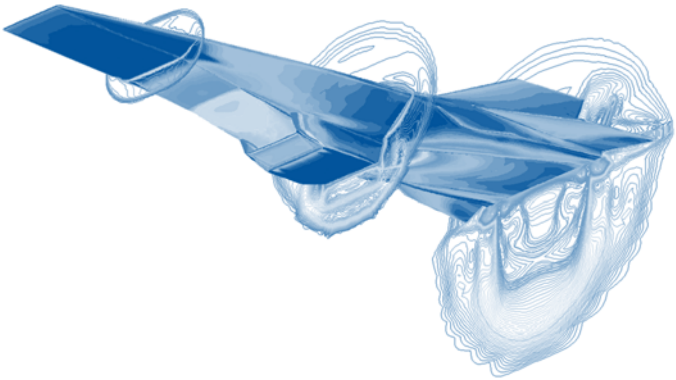
***FREE CONFERENCE REGISTRATION**

Course Synopsis

The course will give an overview of the phenomena that govern fluid-structure interaction, as well as numerical methods that can be used to predict them. A wide range of phenomena, ranging from aeroelasticity to weapon fragmentation, will be covered.

Key Topics

- FSI: Introduction (why, basic phenomena, …)
- PDEs and character of the solutions: structure/fluid/thermal
- Numerical methods I, II
- Solution of the complete system
- Examples
- Current research topics/issues



Instructor

Rainald Löhner, George Mason University

Registration

	By 11 December 2009	After 11 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Introduction to Computational Fluid Dynamics

Scheduled

1 December 2009–30 April 2010
1 December 2010–30 April 2011

Course Synopsis

This comprehensive, three-part series of courses will prepare you for a career in the rapidly expanding field of computational fluid dynamics and fluid turbulence. This course is supported extensively with textbooks, computer programs, and user manuals. You can use the computer programs to develop your own codes, or you may modify the existing codes for assigned applications. You will need access to a computer with a PC pentium processor, FORTRAN compiler, and graphics package for the software applications. A fundamental knowledge of computer programming and familiarity with a basic graphic package are required.

Key Topics

- Learn the terminology used in CFD
- Learn and experience how applications of various numerical schemes to scalar model partial differential equations are used to illustrate the different aspects of CFD
- Improve your understanding of the limitations and advantages of CFD
- Discover why CFD is the tool for fluid flow simulations and prediction that has virtually none of the inherent limitations of other simulation techniques

Instructor

Klaus A. Hoffmann, Wichita State University

Registration

	By 1 November 2009	After 1 November 2009
AIAA Member	$1095	$1200
Nonmember	$1195	$1300
	By 1 November 2010	**After 1 November 2010**
AIAA Member	$1140	$1250
Nonmember	$1240	$1350

Large-eddy Simulations: Theory, Applications, and Advanced Topics

Scheduled

8–9 January 2010 • Orlando, FL
Held in conjunction with the 48th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course will provide an introduction to the large-eddy simulation of turbulent flows, as well as the discussion of some advanced topics. The first day will be devoted to the introductory discussion, including theory and applications of this method. During the second day, two special topics will be discussed, namely LES techniques based on alternative (non-conventional) approaches to subgrid-scale modeling and hybrid RANS/LES methods.

Key Topics

- Numerical techniques for the simulation of turbulent flows
- Theoretical and numerical aspects of large-eddy simulations
- Modeling issues in large-eddy simulations
- Applications of large-eddy simulations
- Alternative approaches to large-eddy simulations
- Hybrid RANS/LES methods

This course is organized under the auspices of the AIAA Fluid Dynamics Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructors

Jack R. Edwards, North Carolina State University
Fernando F. Grinstein, Los Alamos National Laboratory
Ugo Piomelli, Queen's University

Registration

	By 11 December 2009	After 11 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Microfluidics and Nanofluidics: Fundamentals and Applications

Scheduled

8–9 January 2010 • Orlando, FL
Held in conjunction with the 48th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition

***FREE CONFERENCE REGISTRATION**

Course Synopsis

Microfluidics is rapidly emerging as an enabling technology, having applications ranging from unmanned aerial vehicles to ink jet printing to biochemical sensing, filtration and purification processes, to drug discovery and delivery. Given the emerging importance of micro- and nanoscale transport phenomena, this course will provide working level engineers, faculty and managers with an overview and understanding of the fundamental fluid mechanics, heat and mass transfer, and chemistry involved in such devices, as well as the chemistry and engineering principles governing the design of micro- and nanofluidic devices. Case studies will be presented in which the fundamental flow physics at micron and nanometer length scales is used to design innovative devices that could not function at larger length scales.

Key Topics

- Basics of microfluidics and its applications
- Microfluidics at the Army Research Office

- Microscale diagnostic techniques: measuring velocity, temperature, and pressure
- Sensing Technology
- Microfluidic systems

Instructors

David Mott, Naval Research Laboratory
Arfaan Rampersaud, Columbus Nanoworks, Inc.
Thomas Doligalski, U.S. Army Research Office
A. T. Conlisk, Ohio State University
Minami Yoda, Georgia Institute of Technology

Registration

	By 11 December 2009	After 11 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Modern Flow Control I: Intro to Fundamentals and Applications

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Modern passive and active flowfield control is a rapidly emerging field of significant technological importance to the design and capability of a new generation of forthcoming air-vehicle systems, spawning major research initiatives in government, industry, and academic sectors of aeronautics. This completely revised two-day short course will address introductory fundamentals as well as several emerging air-vehicle applications of modern aerodynamic flowfield control techniques. The first day will cover a brief overview of the fundamentals of flow control, including basic concepts, terminology, history, strategies/techniques, actuators, sensors, modeling/simulation, and closed-loop control. The second day will cover applications of flow control to current and next-generation air vehicle systems, including vehicle propulsion integration, airfoil control, noise suppression, wake control, and some forthcoming non-aeronautical applications. A multi-institutional team of eight researchers from government, industry, and academia will cooperatively teach this course.

Key Topics

- Concepts, terminology, and history of flow control
- Flow control strategies
- Actuators and sensors
- Modeling and simulation techniques
- Closed-loop flow control
- Air vehicle applications: Propulsion, airfoil, dynamic flowfield, non-aero

This course is organized under the auspices of the AIAA Fluid Dynamics Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

David Williams, Illinois Institute of Technology

Sensitivity Analysis, Uncertainty Propagation and Validation for Computational Models

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Engineers are faced with the task of producing robust designs more cheaply in order to face the challenges of economic competitiveness. This means that the parameter space that controls the design must be fully explored. Sensitivity analysis is the formal technique of determining those parameters in a system (computational model) that controls its performance. It will identify those parameters that are important as well as those that are unimportant. The course will specifically focus on the following techniques for determining sensitivity information: differentiation of analytical models, finite difference of computational models, complex step method, software differentiation, sensitivity equation methods, adjoint methods, and sampling methods (Monte Carlo and Latin Hypercube). Practical examples will be taken from our experience with these methods. Advantages and disadvantages of each method will be presented. Techniques for propagating uncertainty through computational models and how this computational uncertainty interacts with experimental uncertainty and model validation will be presented.

Key Topics

- Sensitivity analysis of black box models: Finite differences, software differentiation, and sampling methods
- Sensitivity analysis of models with access to source code: Complex step, software differentiation, sensitivity equations, and adjoint methods
- Techniques for rank ordering importance of parameters
- Impact of sensitivity information on experiment design

Instructors

Kevin J. Dowding, Sandia National Laboratories
Bennie Blackwell, Sandia National Laboratories

Stability and Transition: Theory, Modeling, Experiments, and Applications

Scheduled

26–27 June 2010 • Chicago, IL
Held in conjunction with the 27th AIAA Aerodynamics Measurement and Ground Testing Conference, the 28th AIAA Applied Aerodynamics Conference, the 5th Flow Control Conference, the 40th Fluid Dynamics Conference and Exhibit, the 10th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, and the 41st Plasmadynamics and Lasers Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

Knowledge of transition is critical for accurate force and heating predictions and effective control (both transition delay and enhancement). This course reviews the roadmap to transition, including receptivity, attachment line, transient growth, stability, and breakdown; and presents a comprehensive and critical review of current methods used to determine the physics and onset of transition for a wide variety of 2D and 3D flows, both high- and low-speed. Tools reviewed include linear stability theory, parabolized stability equations, and direct numerical simulations. Guidelines for experiments and flight tests are reviewed. Then a comprehensive review of transition region models will be provided including algebraic/integral and differential models. In particular, an approach will be presented in which one calculates onset and extent of transition as part of the solution at a cost typical of turbulent flow calculations. Once the user specifies the transition mechanism, the eddy viscosity of the non-turbulent fluctuations is provided.

Key Topics

- Review of the roadmap to transition, including receptivity, attachment line, transient growth, stability, and breakdown
- Current tools: Linear stability theory, parabolized stability equations, direct numerical simulations
- Guidelines for experiments and flight tests

- Verification and validation for various 2D and 3D flows
- Comprehensive review of correlation-based transition modeling
- Comprehensive review of linear stability theory-based transition modeling

This course is organized under the auspices of the AIAA Fluid Dynamics Technical Committees. A team of expert instructors with experience in industry, government, and academia has been formed.

Instructors

Hassan A. Hassan, North Carolina State University
Helen L. Reed, Texas A&M University
William S. Saric, Texas A&M University

Registration

	By 31 May 2010	After 31 May 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Turbulence Modeling for CFD

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course on turbulence modeling begins with a careful discussion of turbulence physics in the context of modeling. The exact equations governing the Reynolds stresses, and the ways in which these equations can be closed, is outlined. The course begins with the simplest turbulence models and charts a course leading to some of the most complex models that have been applied to a nontrivial turbulent flow problem. The course stresses the need to achieve a balance among the physics of turbulence, mathematical tools required to solve turbulence-model equations, and common numerical problems attending use of such equations. Based on the author's book, *Turbulence Modeling for CFD*, the course reveals a new K-Omega model that applies to boundary layers, free shear flows, and separated flows from incompressible to hypersonic speeds.

Key Topics

- Turbulence physics and the closure problem
- Algebraic models
- One- and two-equation models
- Stress-transport models
- Numerical considerations
- Compressibility effects

Instructor

David C. Wilcox, DCW Industries Inc.

Unstructured Grid Based CFD Methods

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course will focus on numerical methods for compressible flow designed for unstructured grids in computational fluid dynamics. The Godunov-type finite volume methods will be emphasized. The extension of the Godunov method to second and higher order of accuracy will be presented. In addition to the k-exact finite volume method, several more recent methods including the discontinuous Galerkin, spectral volume and spectral difference methods will also be described. The efficient implementation of these methods including data structures to handle unstructured grids will also be discussed. It is expected that the attendees will be able to program a 2D Euler solver for arbitrary grids after taking this class.

Key Topics

- Unstructured grids
- Godunov finite volume method
- Riemann solvers
- Discontinuous Galerkin, spectral volume and spectral difference methods

Instructors

Antony Jameson, Stanford University
Z. J. Wang, Iowa State University

Verification and Validation in Scientific Computing

Scheduled

UPDATED!

26–27 June 2010 • Chicago, IL

Held in conjunction with the 27th AIAA Aerodynamics Measurement and Ground Testing Conference, the 28th AIAA Applied Aerodynamics Conference, the 5th Flow Control Conference, the 40th Fluid Dynamics Conference and Exhibit, the 10th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, and the 41st Plasmadynamics and Lasers Conference

Course Synopsis

The performance, reliability, and safety of engineering systems are becoming increasingly reliant on scientific computing. This short course follows closely the instructors' new book, *Verification and Validation in Scientific Computing*, to be published by Cambridge University Press in 2010. The course deals with techniques and practical procedures for assessing the credibility of scientific computing simulations. It presents modern terminology and effective procedures for verification of numerical simulations and validation of mathematical models that are described by partial differential or integral equations. The approaches presented are applicable to commercial, corporate, government, and research computer codes. While the focus is on scientific computing, experimentalists will benefit from the discussion of techniques for designing and conducting validation experiments. A framework is provide for incorporating various error sources identified during the verification and validation process into the total simulation prediction uncertainty. Application examples are primarily taken from fluid dynamics, solid mechanics, and heat transfer.

Key Topics

- Terminology and definitions
- Verification of codes
- Verification of simulations
- Validation experiments
- Quantitative assessment of model accuracy
- Nondeterministic predictive capability

Instructors

William L. Oberkampf, Sandia National Laboratories (ret.)
Christopher J. Roy, Virginia Tech

Registration

	By 31 May 2010	After 31 May 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Gas Turbine Engines

Numerical Propulsion System Simulation: A Practical Introduction

NEW

Scheduled

29–30 July 2010 • Nashville, TN

Held in conjunction with the 46th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

The objective of this course is to give attendees a working knowledge of Numerical Propulsion System Simulation or NPSS software and allow them to create and/or modify system models using this tool. The course material will discuss the object oriented architecture and how it is used in NPSS to develop flexible yet robust models. A detailed presentation of NPSS execution options, syntax, and interfaces with external codes will be addressed. Overviews of NPSS operation (i.e. Solver, etc.) will also be included. The attendees will be interactively involved with the material by performing exercises on their personal hardware which demonstrates and further clarifies the material being discussed in the lecture. All attendees will be provided with a reduced capability version of NPSS for their use during the course and will be permitted to keep it after the course is completed.

Key Topics

- A basic overview of Numerical Propulsion System Simulation or NPSS
- NPSS's Structure and Capabilities
- An introduction to NPSS syntax
- NPSS interfaces to the outside world
- Examples and exercises to reinforce major concepts

This course is organized under the auspices of the AIAA Gas Turbine Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Instructors

Ian Halliwell, Avetec Inc.
Edward Butzin, Wolverine Ventures, Inc.
Paul Johnson, Wolverine Ventures, Inc.

Registration

	By 28 June 2010	After 28 June 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Gossamer Spacecraft

Gossamer Spacecraft: Analysis and Design

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

An evolving trend in spacecraft is to exploit very small (micro- and nano-sats) or very large (solar sails, antenna, etc.) configurations. In either case, success will depend greatly on ultra-lightweight technology, i.e., "gossamer spacecraft technology." Areal densities of less than 1 kg/m^2 (perhaps even down to 1 g/m^2!) will need to be achieved. This course will provide the engineer, project manager, and mission planner with the basic knowledge necessary to understand and successfully utilize this emerging technology. Definitions,

terminology, basic mechanics and materials issues, testing, design guidelines, and mission applications will be discussed. A textbook and course notes will be provided.

Key Topics

- Introduction to gossamer spacecraft
- Analysis techniques for gossamer spacecraft
- Materials development for gossamer spacecraft
- Design and testing of gossamer spacecraft
- Applications of gossamer spacecraft
- Status and future of gossamer spacecraft

This course is organized under the auspices of the AIAA Gossamer Spacecraft Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Instructors

Paul M. McElroy, McElroy Science and Engineering, Inc.
Richard Pappa, NASA Langley Research Center
Dan K. Marker, AFRL
Chris Jenkins, Montana State University

Ground Testing

Best Practices in Wind Tunnel Testing

NEW

Scheduled

8–9 January 2010 • Orlando, FL

Held in conjunction with the 48th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition

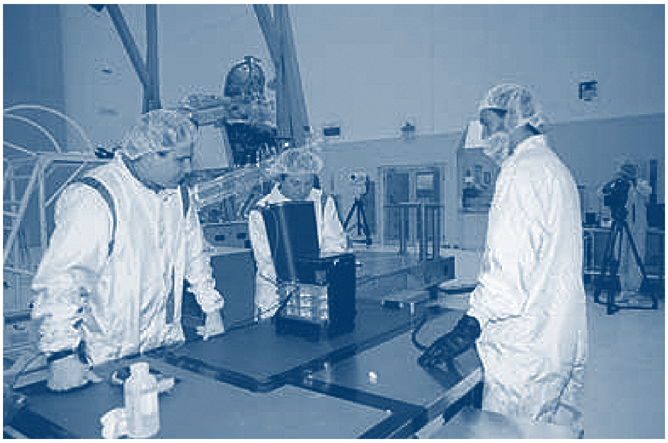
***FREE CONFERENCE REGISTRATION**

Course Synopsis

Best Practices in Wind Tunnel Testing provides an overview of important concepts that are used in many wind tunnel test projects. The course is based largely on AIAA standards documents which focus on ground testing concepts. In particular, the course will address project management aspects of executing a testing project, the use and calibration of strain gage balances, the use of measurement uncertainty in ground testing, and the calibration of wind tunnels.

Key Topics

- Wind tunnel test processes
- Measurement uncertainty analysis for wind tunnel testing
- Internal strain gage balances for wind tunnel testing
- Aero-thermal calibration of wind tunnels



This course is organized under the auspices of the AIAA Ground Testing Technical Committees. A team of expert instructors with experience in industry, government, and academia has been formed.

Instructors

Allen Arrington, NASA Glenn Research Center
David Cahill, Aerospace Testing Alliance
Mark Melanson, Lockheed Martin Aeronautics

Registration

	By 11 December 2009	After 11 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Guidance, Navigation and Control

Advanced Space Vehicle Control and Dynamics

NEW

Scheduled

31 July 2010–1 August 2010 • Toronto, Ontario, Canada
Held in conjunction with the AIAA Guidance Navigation and Control Conference, the AIAA Modeling and Simulation Technologies Conference, the AIAA Atmospheric Flight Mechanics Conference, the AIAA Astrodynamics Specialist Conference, and the AIAA Atmospheric Space Environments Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course presents a coherent and unified framework for mathematical modeling, analysis, and control of advanced space vehicles. Spacecraft dynamics and control problems of practical interests are treated from a dynamical systems point of view. This course will focus on a comprehensive treatment of advanced spacecraft control problems and their practical solutions obtained by applying the fundamental principles and techniques emphasized throughout the textbook. The dynamic modeling, guidance, and flight control design problems of the Ares-I launch vehicle as well as the spacecraft dynamics and control problem of asteroid deflection missions will also be covered. This course is based on the second edition of the AIAA textbook, *Space Vehicle Dynamics and Control*.

Key Topics

- Fundamentals of orbital, attitude, and structural dynamics of space vehicles
- Classical and advanced control design methods for complex space vehicles
- Modeling and control of advanced space vehicles for future space missions
- Advanced space vehicle examples include: agile imaging satellites equipped with CMGs; large solar sails for future science missions; solar-sail missions for asteroid deflection; kinetic impactors and gravity tractors for asteroid deflection; Ares-I launch vehicle; and very large space solar power satellites

Instructor

Bong Wei, Iowa State University

Registration

	By 5 July 2010	After 5 July 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Aircraft and Rotorcraft System Identification: Engineering Methods and Hands-on Training Using CIFER®

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The objectives of this two-day short course are to: (1) review the fundamental methods of aircraft and rotorcraft system identification and illustrate the benefits of their broad application throughout the flight vehicle development process; and (2) provide the attendees with an intensive hands-on training of the CIFER® system identification, using flight test data and 10 extensive Lab exercises. Students work on comprehensive laboratory assignments using student version of software provided to course participants (requires student to bring NT laptop). The many examples from recent aircraft programs illustrate the effectiveness of this technology for rapidly solving difficult integration problems. The course will review key methods and computational tools, but will not be overly mathematical in content. The course is highly recommended for graduate students, practicing engineers, and managers.

Key Topics

- Overview of system identification methods and applications
- Flight testing and instrumentation for handling-qualities and manned/unmanned control system development
- Simulation model fidelity analysis and design model extraction from prototype flight testing
- Flight test validation and optimization of aircraft dynamics and control
- Hands-on training in system identification training using CIFER®
- Over the two-day course students work ten comprehensive labs on model identification and verification using flight test data

Instructor

Mark B. Tischler, Army/NASA Rotorcraft Division

Aircraft Handling Qualities

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Application of solid flying qualities criteria is key to cost-effective flight control system and control law design, analysis, and test processes for all aircraft types. And these criteria, originally developed for piloted aircraft, are now being applied directly to new generations of unmanned aircraft. This course provides the insight to determine which of many requirements are key to development and evaluation of any particular aircraft. The essentials of flight dynamics are still included, however the course has been updated extensively with MATLAB methods, with expanded emphasis on lessons learned and with material to help you write a specification for your vehicle. The emphasis is on fixed-wing aircraft but some rotary-wing criteria are briefly discussed.

Key Topics

- Basics of flight dynamics: equations of motion, the simple linearized approximations that give us the insight we need, plus the nonlinearities we cannot ignore.
- Effects of feedback control systems: Review/introduction to the commonly-used feedback architectures and how they affect the response.
- Response criteria: longitudinal and lateral-directional dynamics and the basic criteria that avoid problems like pilot-induced (or system-induced) oscillations.
- Lessons learned in aircraft development programs: what to do, what to stay away from. Contrasts in manned and unmanned aircraft development.
- How to use all this information and lessons learned to write a specification for your vehicle.

Instructor

John Hodgkinson, AeroArts, Inc.

Emerging Principles in Fast Trajectory Optimization

Scheduled

31 July 2010–1 August 2010 • Toronto, Ontario, Canada
Held in conjunction with the AIAA Guidance Navigation and Control Conference, the AIAA Modeling and Simulation Technologies Conference, the AIAA Atmospheric Flight Mechanics Conference, the AIAA Astrodynamics Specialist Conference, and the AIAA Atmospheric Space Environments Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

The confluence of major breakthroughs in optimal control theory and computational power has made possible the rapid computation of optimal control problems. This implies that mission design analysis can be carried out in a quick and efficient manner with the only limitation being the designer's imagination. This course will introduce the student to the major advancements that have taken place over the last decade in both theory and computation that makes fast solution to constrained nonlinear optimal control problems possible.

Key Topics

- What kinds of optimal control problems are solvable today and why?
- Mathematical background of modern computational optimal control
- Covector Mapping Principle for computational optimal control
- New techniques in verification and validation
- Real-time trajectory optimization

Instructors

I. Michael Ross, Naval Postgraduate School
Qi Gong, University of California, Santa Cruz

Registration

	By 5 July 2010	After 5 July 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Kalman Filtering: A Practical Approach

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

In this course, a pragmatic and nonintimidating approach is taken in showing participants how to build both linear and extended Kalman filters by using numerous simplified but nontrivial examples. Sometimes mistakes are intentionally introduced in some filter designs in order to show what happens when a Kalman filter is not working properly. Design examples are approached in several different ways in order to show that filtering solutions are not unique and also to illustrate various design tradeoffs. The course is constructed so that participants with varied learning styles will find the course's practical approach to filter design to be both useful and refreshing.

Key Topics

- Learn how to build both linear and extended Kalman filters
- How process noise can save many filter designs from failing
- Why some choices of filter states are better than others
- Advantages and disadvantages of filtering in different coordinate systems
- Why linear filters are sometimes better than extended filters for some nonlinear problems
- Use source code to explore issues beyond the scope of the course

Instructor

Paul Zarchan, MIT Lincoln Laboratory

Mathematical Introduction to Integrated Navigation Systems with Applications

Scheduled

31 July 2010–1 August 2010 • Toronto, Ontario, Canada
Held in conjunction with the AIAA Guidance Navigation and Control Conference, the AIAA Modeling and Simulation Technologies Conference, the AIAA Atmospheric Flight Mechanics Conference, the AIAA Astrodynamics Specialist Conference, and the AIAA Atmospheric Space Environments Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

The subject of integrated navigation systems is presented. "Integrated navigation systems" is the combination of an on-board navigation solution providing position, velocity, and attitude as derived from accelerometer and gyro inertial sensors, with independent navigation aide data to update or correct this on-board navigation solution. In this course, and described in the accompanying textbook, this combination is accomplished with the use of the Kalman filter algorithm. This course is presented to two parts. In the first part, elements of the basic mathematics, kinematics, equations describing various navigation systems and their error models, aides to navigation and their error models, and Kalman filtering are reviewed. Kalman filtering algorithm forms developed include; standard Kalman, Joseph, U-D factored, combining multiple filters, and derivative free algorithms—UKF and DDF. Applications of the course material presented in the first part are presented for various integrated navigation systems in the second part.

Key Topics

- Navigation overview: From dead-reckoning to inertial navigation
- Coordinate systems: How we relate information so that others can use it
- Navigation equations: Position, velocity, and attitude on-board solution

- Navigation aides: Redundant information to correct navigation solution
- Kalman filtering: Optimal combination of navigation solution and aiding data
- Applications: Calibration, alignment, integrated INS/GPS; MATLAB/Simulink examples in textbook's second edition

Instructor

Robert M. Rogers, Rogers Engineering and Associates

Registration

	By 5 July 2010	After 5 July 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Optimal State Estimation

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The Instructor presents state estimation theory clearly and rigorously, providing the right balance of fundamentals, advanced material, and recent research results, to enable the student to confidently apply state estimation techniques in a variety of fields. The features of this course include: A straightforward, bottom-up approach that begins with basic concepts, and then builds step-by-step to more advanced topics; Simple examples and problems that require paper and pen to solve, which leads to an intuitive understanding of how theory works in practice; MATLAB®-based source code that implements state estimation for realistic engineering problems, which enables students to recreate results and experiment with other simulation setups and parameters. Armed with a solid foundation in the basics, students are presented with a careful treatment of advanced topics, including H-infinity filtering, unscented filtering, high-order nonlinear filtering, particle filtering, constrained state estimation, reduced order filtering, robust Kalman filtering, and mixed Kalman/H-infinity filtering.

Key Topics

- Fundamentals (linear systems, probability, and least squares estimation)
- Kalman filtering and smoothing
- Kalman filter generalizations
- H-infinity filtering
- Nonlinear Kalman filtering
- Unscented Kalman filtering and particle filtering

Instructor

Daniel Simon, Cleveland State University

The Proper Use of Mars Atmospheric Models in Mission Applications

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The short course, presented by prominent Mars atmosphere modelers, is designed for scientists, engineers, and other mission personnel who use the data from atmospheric models and would like to more fully understand the origin of the data, its strengths, and its limitations. A background in atmospheric modeling, atmospheric dynamics, or programming is not required or expected; the course is descriptive in nature with numerous examples illustrating all the main points. Models and data covered in the course include: lower and upper atmosphere general circulation models (GCMs), mesoscale models, and engineering models (e.g., MARS-GRAM).

Key Topics

- Lower Atmosphere General Circulation Models for Entry, Descent and Landing
- Mesoscale and Large Eddy Circulation Models for EDL
- Upper Atmosphere General Circulation Models for Aerobraking
- Engineering Models (Mars-GRAM) for EDL and Aerobraking
- Understanding Strengths, Weaknesses and Limitations of Models
- Best Practices and Common Pitfalls of Model Applications

Instructors

Geoffrey Crowley, ASTRA
Scot Rafkin, Southwest Research Institute
Carl Gerald Justus, Morgan Research Corporation
Alison Bridger, San Jose State University
Jeff Barnes, Oregon State University

Robust and Adaptive Control Theory

Scheduled

31 July 2010–1 August 2010 • Toronto, Ontario, Canada
Held in conjunction with the AIAA Guidance Navigation and Control Conference, the AIAA Modeling and Simulation Technologies Conference, the AIAA Atmospheric Flight Mechanics Conference, the AIAA Astrodynamics Specialist Conference, and the AIAA Atmospheric Space Environments Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This three part workshop presents aerospace applications in robust control design and analysis and recent advances in adaptive flight control. Robust baseline control augmented with adaptive increments to further improve performance and robustness is used. Examples include advanced weapons and the X-45A J-UCAS. Part 1 covers robustness theory and practical optimal control methods and lessons learned. Part 2 contains an overview of adaptive methods and Lyapunov stability theory, model reference adaptive control, and neural networks adaptive control, with applications. Part 3 introduces new L1 adaptive control. L1 theory enables theoretical predictions of closed-loop transient performance and stability margins. Simulation and flight examples are presented. The workshop focuses on the theory, methods, and application lessons learned in robust and adaptive control for fighter aircraft and advanced weapon systems. Prerequisites include classical control, frequency domain, and state space control system design and analysis. MATLAB® files will be included.

Key Topics

- Lessons learned in applying robust control to aircraft, missiles, munition, and ejection seats
- Linear robust control theory design and analysis
- Using robustness theory to analyze and specify hardware requirements
- Neural adaptive control of uncertain dynamical systems
- MRAC for systems with limited actuation
- Lessons learned in applying neural adaptive control to unmanned aircraft (X-36 and X-45A) and munitions (JDAM)

Instructors

Kevin Wise, The Boeing Company
Eugene Lavretsky, The Boeing Company
Naira Hovakimyan, Virginia Polytechnic Institute

Registration

	By 5 July 2010	After 5 July 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Vision-Based Control for Autonomous Vehicles

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course will present an in-depth treatment on vision-based control and its application to autonomous vehicles. The maturation of synthetic vision is rapidly advancing the capability for fully autonomous decision making to maneuver through environments with unknown obstacles. This course will introduce the basics of synthetic vision and build up state-of-the-art developments in vision-based control. Techniques such as scene reconstruction and state estimation are formulated to provide feedback. Control approaches, both nonlinear and robust, are synthesized to utilize the vision-based feedback for decision making. The entire process, including path planning, is thus constructed from a series of subtasks.

Key Topics

- Camera characteristics
- Scene reconstruction
- State estimation
- Robust vision
- Visual-servo control
- Path planning

Instructors

Warren Dixon, University of Florida
Andrew Kurdila, Virginia Polytechnic Institute
Richard C. Lind, University of Florida

Hybrid Propulsion

Hybrid Rocket Propulsion

Scheduled

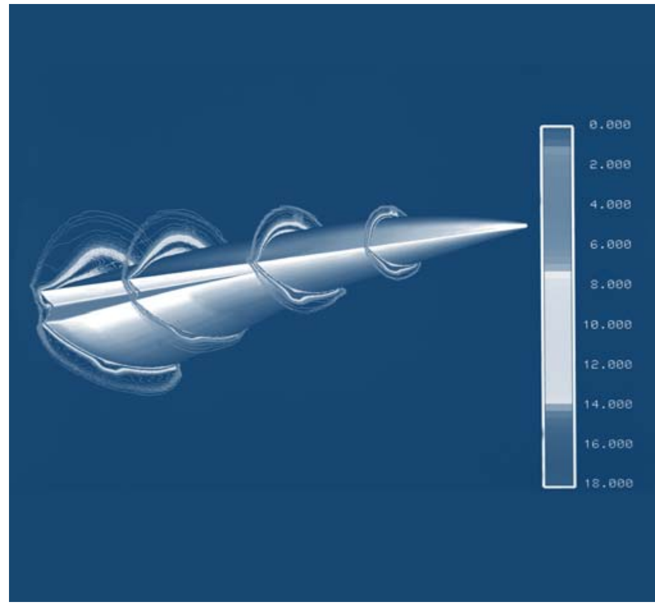
This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The "Hybrid Rocket Propulsion" short course is quintessential for all professionals specializing in chemical propulsion. The mechanisms associated with hybrid combustion and propulsion are diverse and affect our abilities to successfully advance and sustain the development of hybrid technology. It is our penultimate goal to promote the science of hybrid rocketry which is safe enough to be used in academia and the private sector. A historical demonstration of hybrid rocket capability is the 2004 X PRIZE winner SpaceShipOne. This course reviews the fundamentals of hybrid rocket propulsion with special emphasis on application-based design and system integration, propellant selection, flow field and regression rate modeling, solid fuel pyrolysis, scaling effects, transient behavior, and combustion instability.

Key Topics

- Introduction, Classification, Challenges, and Advantages of Hybrids
- Similarity and Scaling Effects in Hybrid Rocket Motors
- Analytical Flowfield Modeling of Classical and Non-Classical Hybrid Rockets



- Solid Fuel Pyrolysis Phenomena and Regression Rate: Mechanisms and Measurement Techniques
- Combustion Instability and Transient Behavior in Hybrid Rocket Motors
- Metals, Other Energetic Additives, and Special Binders Used in Solid Fuels for Hybrid Rocket Applications

This course is organized under the auspices of the AIAA Hybrid Propulsion Technical Committee.

Instructor

Joe Majdalani, University of Tennessee Space Institute

Hypersonic Systems

Hypersonic Aerodynamics

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This is a course on the fundamental principles of hypersonic aerodynamics. It is a self-contained course for those students and professionals interested in learning the basic physical aspects of hypersonics. It assumes no prior familiarity with the subject. If you have never worked extensively in the area, or never studied hypersonics, this course is for you. It is a cohesive presentation of the fundamentals, a development of important theory and techniques, a discussion of the salient results with emphasis on the physical aspects, and a presentation of modern thinking on the subject. The course is organized around the classic textbook by the instructor: *Hypersonic And High Temperature Gas Dynamics*, originally published by McGraw-Hill and reprinted by AIAA. Each student will receive this textbook as part of the course material.

Key Topics

- Inviscid Hypersonic Flow
- Viscous Hypersonic Flow
- High-Temperature Gas Dynamics

Instructor

John D. Anderson Jr., Smithsonian Institution

Hypersonic Integrated Test and Evaluation

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course provides an overview of test and evaluation methods for hypersonic testing. Advanced hypersonic systems pose tremendous challenges on hypersonic test requirements. Different approaches for addressing these challenges, including the development of state-of-the-art facilities and experimental flight test, are discussed. This tutorial will present relevant experience of testing of aircraft-like hypersonic vehicles. The need for the flight testers to participate early in design of the vehicle and the need for early definition of the flight test concept will be emphasized. Examples will be given and the impact on ground support systems, data acquisition range, range safety, and environmental impact requirements will be discussed. Other topics will include envelope expansion considerations and contingency planning. Information presented will be based on the instructor's hands-on experience with the X-15, lifting bodies, space shuttle orbiter reentry, X-30, and X-33.

Key Topics

- Pre-test program preparation
- Pre-flight ground tests
- Flight test plans and profiles
- Flight tests
- Data analysis and reporting
- Management considerations

Instructor

Dan Marren, AEDC

Hypersonic Test Facilities

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course provides an overview of hypersonics, describes systems that might benefit from the application of hypersonic technologies, test requirements and methods and techniques to achieve successful hypersonic design data. Tools and facilities for hypersonic testing are discussed. Advanced hypersonic systems pose tremendous challenges on hypersonic ground test requirements. Different approaches for addressing these challenges are discussed, including the development of state-of-the-art facilities, novel uses for current capability sets, and advanced concepts for increasing the replication of salient physics of hypersonic environments. Examples of hypersonic test techniques and challenging test environments are demonstrated for discussion purposes.

Key Topics

- Hypersonic Test Requirements
- Definitions and terms
- Systems that benefit from high-speed
- Challenges to hypersonic design
- Principles of Hypersonic Test Facility Development
- Impulse Facilities
- Long Duration Facilities
- Test Ranges and Tracks
- Next-Generation Facilities

Instructor

Dan Marren, AEDC

Intelligent Systems

State Analysis: A Model-based Engineering Method for Systems and Software Engineers

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

It has become clear that spacecraft system complexity is reaching a threshold where customary methods of control are no longer affordable or sufficiently reliable. Furthermore, there is a fundamental gap between the requirements on software specified by systems engineers and the implementation of these requirements by software engineers. This gap opens up the possibility for misinterpretation of the systems engineer's intent, potentially leading to software errors. This problem is addressed by a systems engineering methodology called State Analysis, which provides a process for capturing requirements on system and software design in the form of explicit models of system behavior, and defines a state-based architecture for the control system. This short course describes how model-based requirements for complex aerospace systems can be developed using State Analysis and how these requirements inform the design of the system software, using representative spacecraft examples.

Key Topics

- What State Analysis is and what motivates it
- The three main aspects of State Analysis: State-based behavioral modeling
- The three main aspects of State Analysis: State-based software architecture and control system design based on the state-based behavioral models
- The three main aspects of State Analysis: Goal-directed operations engineering based on the state-based behavioral models
- Direct mapping of fundamental State Analysis elements into a state-based software framework
- Implementation of control systems using the state-based software framework

Instructors

Daniel Dvorak, NASA JPL
Michel Ingham, NASA JPL

Legal Aspects of Aeronautics and Astronautics

Fundamentals of the International Traffic in Arms Regulations for Commercial/Civil Space Activities

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The ITAR has a significant impact on most involved in the commercial/civil space industry, including U.S. and certain foreign satellite operators, satellite manufacturers, consultants, and insurers. An understanding of the ITAR can make the ITAR manageable. This one-day course will provide an introduction to the fundamentals of the ITAR for those whom the ITAR affects, but who do not work with ITAR compliance on a daily basis. Engineers, program managers, scientists, salespersons, contract managers, attorneys, and executives will all benefit from this course.

Key Topics

- Why the International Traffic in Arms Regulations apply to commercial/civil space activities
- Scope of the ITAR as relates to commercial/civil space activities
- The ITAR regulatory process and licensing
- Foreign national employees of U.S. entities
- Managing ITAR compliance to minimize program disruption when working with international partners
- Update on recent ITAR developments

Instructor

John Ordway, Berliner, Corcoran and Rowe, LLP

Liquid Propulsion

Liquid Propulsion Systems—Evolution and Advancements

Scheduled

UPDATED!

29–30 July 2010 • Nashville, TN

Held in conjunction with the 46th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

Liquid propulsion systems are critical to launch vehicle and spacecraft performance, safety, and cost. This two-day course, taught by a team of propulsion experts, will cover Rocket Propulsion Fundamentals; Propulsion Chemistry; Converting Chemistry into Performance; Launch Vehicle Propulsion; Spacecraft Propulsion; and Applying Propulsion Lessons Learned.

Key Topics

- Propulsion requirements: how spacecraft missions, launch vehicle performance, physics, and chemistry drive propulsion subsystem requirements
- Propulsion fundamentals: The chemistry of propellants and the physics that results in thrust, specific impulse, energy, and momentum
- Ignition and nozzles: how the chemistry and physics comes together to create thrust
- Launch vehicle propulsion: large engines and turbomachinery, trajectories, performance, and design drivers
- Spacecraft and satellite propulsion: small engines and pressure fed systems including how liquid propulsion system plumbing schematic designs support meeting specific requirements
- Applying lessons learned: how to take advantage of the work done and experience gained over many missions

This course is organized under the auspices of the AIAA Liquid Propulsion Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

Alan Frankel, AMPAC In-Space Propulsion

Registration

	By 28 June 2010	After 28 June 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Management

Effective Risk Management

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

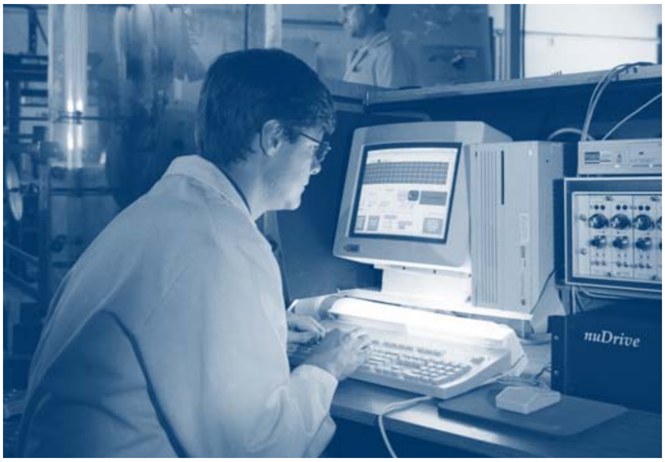
Risk management is a key process used on many projects and programs. Achieving effective risk management is often illusive. This course offers a comprehensive look at the risk management process (including risk and opportunity), including tips to succeed and traps to avoid based upon 700+ lessons learned from actual projects. The companion book to this course is: *Effective Risk Management: Some Keys to Success, Second Edition*, American Institute of Aeronautics and Astronautics, 2003, 532 pp. The course covers key concepts for both the risk management process and its implementation, while the book expands upon this and provides a valuable reference for both technical and non-technical personnel. The course provides practical, ready-to-use approaches using examples from actual programs. Attendees will immediately be able to evaluate and improve an existing risk management process or help implement risk management on a new project.

Key Topics

- Develop a five-step risk management process (addressing risks and opportunities) for a new project/program and proposals or evaluate an existing process, identify its shortfalls, and develop recommendations to improve the existing process (throughout material)
- Apply focused lessons learned from actual projects/programs to help improve existing or new risk management processes (throughout material)
- Identify and overcome organizational and behavioral barriers to successfully implement risk and opportunity management (throughout material)
- Effectively integrate risk and opportunity management into project management, systems engineering, and other key processes (throughout material)
- Explore a variety of key qualitative and quantitative tools and techniques for risk and opportunity identification and analysis (e.g., checklists, risk scales, risk mapping matrices, Monte Carlo simulations), and understand their strengths and limitations (throughout material)
- Develop risk and opportunity handling strategies using a simple but powerful structured approach that are often far more effective than those produced by unstructured approaches

Instructor

Edmund H. Conrow, www.risk-services.com



Human Factors Investigations in the Workplace with Integrated Methods and Data Management

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course provides participants with a detailed knowledge of human factors investigations and investigative standards and will provide the necessary tools and software to successfully complete a human factors investigation. Participants will learn standardized investigative methods to capture and trend human errors to prevent future incidents in the workplace. Instruction will include use of data management software that will allow managers to validate and trend error data for effective human error mitigation. While this course targets the aviation/aerospace industry, all government, safety personnel, security managers, maintenance supervisors, team leads, accident investigators, and systems data managers can benefit from this course, as it also discusses mitigation of errors within the investigative process.

Key Topics

- Human performance principles
- Error management
- Investigative process and standard methods
- Human factors cause codes
- Data collection and trending
- Database management

Instructor

Lynda Bottos, Bottos-Hughes Enterprises

Management of Space Technology

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course examines political, organizational, and technical factors of management of space technology programs. The interrelationships among these factors influence management processes and outcomes that determine whether implementation of complex space programs is met with success or failure. From a political standpoint, the ways in which program and project leaders navigate among accountability practices is scrutinized. The relevant practices encompass: political factors, like cost and schedule; organizational factors, such as standard operating procedures; and technical factors concerning the inherent nature of how complex technology functions. For the organizational level, how technical professionals at the supervisory level navigate decision-making structures and organizational cultures is investigated. This establishes the ways in which risk, high-reliability, and high-performance are understood and managed. At the technical level, how project practitioners dealing with systems architecturing and systems integration work navigate between the development of complex space technology and systems management methods and systems engineering is explored.

Key Topics

- Variables of space management – political, organizational, and technical
- Management processes and outcomes that allow successful implementation of complex systems
- Determine the success or failure of large-scale space technology

Instructor

Eligar Sadeh, Astroconsulting International LLC

Practical Project Management for Aerospace Professionals

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The aerospace industry is project focused and new technology intensive, from small R&D efforts to large-scale spacecraft systems integration. No matter the project, sound application of project management skills leads to better chances of project and program success. This offering will enable participants to apply the project management body of knowledge (PMBOK) to typical project situations aerospace professionals face on a daily basis. In addition to the traditional problem areas of risk, quality, and estimating, particular attention will be paid to the soft skill sets enabling effective collaboration, communication, and problem solving among engineers, technicians, scientists, managers, and stakeholders. Tools and techniques such as earned value analysis will be presented. Participants will work through realistic aerospace project scenarios that illustrate how the proper knowledge, tools, and techniques can help improve project performance. Participants will have the opportunity to apply the knowledge learned directly to their projects.

Key Topics

- Importance and value of project management
- Project management knowledge basics, skills, and techniques
- Focus on solving key problem areas such as quality, estimating, and tracking progress
- How to handle risks, issues, changes, and problems
- Understand the major key to project success: communication
- Application to typical aerospace project scenarios

Instructors

Ronald S. McCandless, PMP, McGinley Consulting Group
Roland Scott, PMP, The Pilot Group

Space Politics and Policy: An Evolutionary Perspective

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The Space Policy Professional Development Course provides a comprehensive analysis of space policy encompassing the United States civil, commercial, and military space programs. This two-day (16 hour) course is based on lectures, discussions, and the use of a book by Eligar Sadeh, *Space Politics and Policy: An Evolutionary Perspective*, as well as additional publications that deal with space policy. The course examines space policy at several levels of analysis including agenda-setting, formulation, implementation, and policy outcomes. Agenda-setting concerns the historical context of the space age, the rationales used to justify space programs, and the advocates of those programs. Formulation focuses on the political actors and institutions, and the role they play in establishing space policy. Implementation deals with the management of space programs and projects. The policy outcomes addressed in this course include: space and the environment; international space law; space commerce; international space cooperation; and military space policy.

Key Topics

- Space policy trends and developments
- Administration and management of space projects and programs
- Space law
- Space commercialization
- International space cooperation
- Military space policy

Instructor

Eligar Sadeh, Astroconsulting International LLC

Materials

Aluminum Processing, Properties and Applications

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course is intended for anyone who fabricates, specifies, purchases, or uses aluminum in their structural designs. It covers alloys and temper designations as well as how composition and processing influences properties. Heat treatment is discussed with emphasis on obtaining optimum properties for a given design. This course builds on these concepts to give the student the ability to select specific alloys and tempers for their applications. Numerous issues specific to aluminum will be discussed and demonstrated with real world, hands-on examples that will prevent failure of your aluminum component designs. The course discusses the mechanisms of corrosion in aluminum aerospace alloys, as well as design and finishing methods to mitigate their damage. Students are encouraged to bring their aluminum questions and design challenges with them to the course.

Key Topics

- Aluminum Alloy and Temper Designations
- Compositional Effects in Aluminum Alloys
- Aluminum Processing and Heat Treatment
- Corrosion and Finishing of Aluminum Components
- Prevention of Failure of Your Aluminum Component Designs

Instructor

Kevin Anderson, Mercury Marine

Meshing, Visualization, and Computational Environments

Grid Generation

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course will enable the participants to understand the geometry and grid generation processes at a very high level, with specific emphasis given to the various approaches available today. Through a discussion of the strengths and weaknesses of the approaches, the participants will be able to determine which approach is most appropriate for their applications. Furthermore, this course will provide the participants with enough understanding of the process so that they can assess and potentially improve the grid generation process in their own organization. This course is also appropriate for practitioners who are faced with applying a new technique.

Key Topics

- Grid generation basics
- Geometry definition
- Grid techniques: Block-structured, Cartesian, unstructured, hybrid, overset
- Grid adaptation
- Future directions
- Ten questions to ask your grid generator

This course is organized under the auspices of the AIAA Meshing, Visualization, and Computational Environments Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

John Dannenhoffer, Syracuse University

Missile Systems

Making Decisions in Missile Defense

Scheduled

NEW

18–19 January 2010 • Monterey, CA
Held in conjunction with the AIAA Strategic and Tactical Missile Systems Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course treats in a consistent manner the various key factors that must be taken into account when deciding on the form of missile defense for any nation. It first takes the technical factors of performance, cost, schedule and risk and determines which system out of a set of candidate systems provides the best solution based on a given set of easily understood criteria. These technical solutions are then modified, in a controlled and transparent manner, by such modifiers as political factors, national requirements and other less tangible factors. All factors are presented with both historical background trends for contextual appreciation and with known values that can be either statistical state-of-the-art values or user input values as needed. Engineering formulation of equations and data is provided sparingly where necessary for technical background and for sensitivity analyses.

Key Topics

- Making Decisions and Form of Defense
- Nature of Missile Threat

- Performance
- Cost and Risk
- Acquisition Schedule
- Evaluation

Instructor

Peter Mantle, U.S. Navy

Registration

	By 21 December 2009	After 21 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Modern Missile Guidance

Scheduled

14–15 November 2010 • Monterey, CA
Held in conjunction with the Missile Sciences Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course presents both fundamental concepts and practical implementation of parallel navigation. The guidance law design is considered from the point of view of control theory, i.e., as design of controls guiding missiles to hit targets. Guidance laws design is considered as design of controls. The design procedure is presented in the time domain and in the frequency domain. The different approaches, in the time and frequency domain, generate different guidance laws that supplement each other. The proportional navigation is considered also as a control problem. A class of guidance laws is obtained based on Lyapunov approach. The problem of modification of the existing autopilots is presented as a problem of new guidance laws design. Computational aspects of new missile guidance laws are considered.

Key Topics

- Basics of Missile Guidance. Parallel Navigation
- Analysis of PN Guided Missile Systems in Time Domain
- Analysis of PN Guided Missile Systems in Frequency Domain
- Design of Guidance Laws Implementing Parallel Navigation. Time-domain Approach. Frequency-domain Approach
- Guidance Law Performance Analysis Under Stochastic Inputs
- Integrated Missile Design

Registration

	By 18 October 2010	After 18 October 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Instructor

Rafael Yanushevsky, Research and Technology Consulting

Tactical and Strategic Missile Guidance

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Whether you work in the tactical world or the strategic world, this course will help you understand and appreciate the unique challenges of each. So that everyone can clearly understand the principles of both tactical and strategic missile guidance, concepts are derived mathematically, explained from a heuristic perspective, and illustrated with numerical examples and computer animations. You will find out why missile guidance is not a minor engineering detail, and you will discover how to use course source code effectively. Course mathematics and examples are nonintimidating.

Key Topics

- Interceptor guidance system technology
- How subsystems influence total system performance
- Useful design relationships for rapid guidance system sizing
- Using adjoints to analyze missile guidance systems
- Comparison of adjoint and Monte Carlo methods

Instructor

Paul Zarchan, MIT Lincoln Laboratory

Tactical Missile Design–Integration

Scheduled

UPDATED!

18–19 January 2010 • Monterey, CA
Held in conjunction with the AIAA Strategic and Tactical Missile Systems Conference
29–30 July 2010 • Nashville, TN
Held in conjunction with the 46th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This is a self contained short course on the fundamentals of tactical missile design and integration. The course provides a system-level, integrated method for missile aerodynamic configuration/propulsion design and analysis. It addresses the broad range of alternatives in meeting performance, cost and other measures of merit requirements such as robustness, lethality, accuracy, observables, survivability, and reliability. Methods are generally simple closed-form analytical expressions that are physics-based, to provide insight into the primary driving parameters. Configuration sizing examples are presented for rocket, turbojet, and ramjet-powered missiles. Typical values of missile parameters and the characteristics of current operational missiles are discussed. Also discussed are the enabling subsystems and technologies for tactical missiles, the current/projected state of the art, and launch platform integration. Videos illustrate missile development activities and performance. Attendees will vote on the relative emphasis of types of targets, types of launch platforms, topics, and one-on-one/round-table discussion.

Key Topics

- Key drivers in the missile design process
- Critical trade-offs, methods, and technologies in subsystems, aerodynamics, propulsion, and structure sizing
- Launch platform-missile integration
- Robustness, lethality, accuracy, observables, survivability, reliability, and cost considerations
- Missile sizing examples and the development process for missile systems and missile technologies

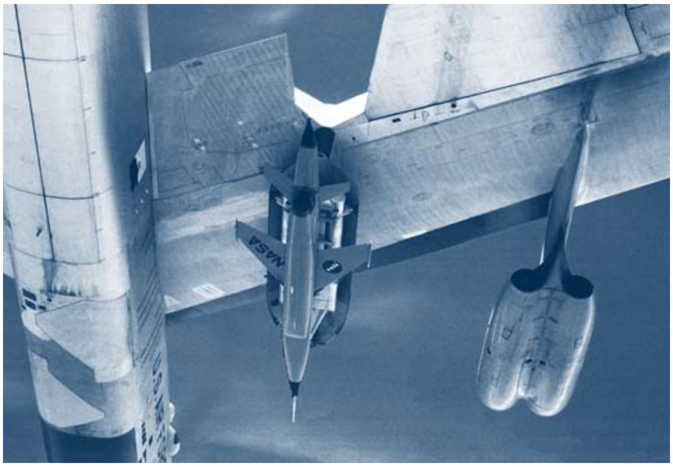
Instructor

Eugene L. Fleeman, Consultant

Registration

Monterey, CA	By 21 December 2009	After 21 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Nashville, TN	By 28 June 2010	After 28 June 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375



Modeling and Simulation

C++ in Aerospace Simulations— Hands-On Workshop

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This two-day workshop introduces engineers and programmers to object oriented programming of aerospace vehicle simulations. C++ constructs like polymorphism, inheritance, and encapsulation will be applied, while a multi-object UAV simulation is being built. To provide hands-on experience, the course alternates between lectures and experiments. The instructor introduces C++ features together with modeling of aerodynamics, propulsion, and autopilot, while the trainee executes and modifies the simulation. All source code and plotting programs will be provided as well as the textbook, *Modeling and Simulation of Aerospace Vehicles*, authored by the instructor. Participants should bring an IBM PC compatible laptop computer with Microsoft Visual C++ 2007 (free download from MS). As prerequisites, facility with C++ and familiarity with flight dynamics is desirable. This course highlights C++ architectures of aerospace simulations and culminates in a multi-object simulation of interacting UAVs, satellites and targets, which can serve as the basis for further development.

Key Topics

- Insight into the power of C++ as applied to aerospace simulations
- Understanding UAV aerodynamics, propulsion, guidance and control
- Hands-on experience with a netcentric UAV simulation
- Know how to develop your own aerospace simulations from provided source code

Instructor

Peter H. Zipfel, University of Florida

Engineering Computations and Modeling in MATLAB/Simulink

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

MATLAB/Simulink has become a very popular “must know” tool used by students, engineers, and scientists in universities, research institutes, and industries. It is widely used for numerical and symbolic math computations, modeling and simulations, data analysis and processing, visualizations and graphics, algorithm and GUI development. This course covers what is included into the Student edition of MATLAB and offers an introduction to understanding and using the MATLAB/Simulink/GUIDE development environment for addressing different engineering problems. This course explains what is needed to use The MathWork's software effectively: from handling simple arithmetic operations with scalars and arrays to writing M-scripts implementing major numerical methods for the solution of selected problems in engineering, from using simple graphics and built-it user menus to developing sophisticated GUIs and animations, from solving initial-value problems in MATLAB to modeling in Simulink.

Key Topics

- Efficient programming in the MATLAB development environment
- Employing graphical user interfaces and animations
- Augmenting computational efficiency with symbolic mathematical operations
- Practical aspects of using major numerical methods available via MATLAB functions
- Advantages of using Simulink for modeling and simulations of the dynamic systems

Instructor

Oleg A. Yakimenko, Naval Postgraduate School

Introduction to Modeling and Simulation

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This overview course is a tutorial on the concepts and uses of modeling and simulation (MandS). The objective is to provide participants with a useful understanding of the basic ideas, key technologies, and typical applications of MandS. It will enhance each participant's ability to understand how and when to use MandS and provide a starting point for persons who will perform MandS tasks. It will provide the participant with basic skills in the two key techniques for modeling operations and logistics: discrete event simulation and system dynamics.

Key Topics

- Basic MandS concepts and definitions
- Modeling methods
- Statistics for MandS
- Distributed simulation
- Discrete event simulation
- System dynamics

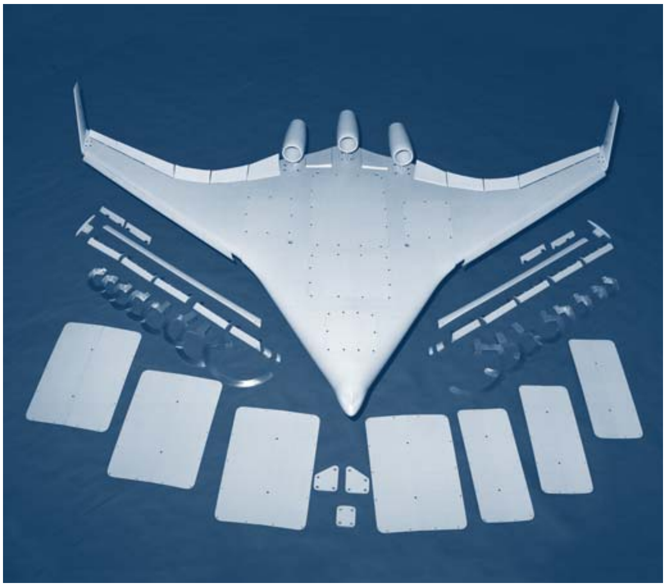
Instructors

Roland R. Miekle, Old Dominion University
John A. Sokolowski, Old Dominion University
Michael L. McGinnis, Old Dominion University

MATLAB and Simulink for Control Design Acceleration

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.



Synopsis

This is a two day hands-on course, offered by The MathWorks, designed to provide a general understanding of how to use the MathWorks suite of control system design tools to accelerate the design process. The course will begin with a discussion of how to model dynamic systems in the MATLAB and Simulink environments. Common control design tasks, such as linearization and compensator design using classical approaches (root locus, Bode, etc.) are covered. The course will also cover deployment of a control algorithm using automatic C code generation via Real-Time Workshop. These topics will be discussed in relation to a motion control application and several other examples. The course will also provide a brief introduction to Aerospace Toolbox and Aerospace Blockset, which extend MATLAB and Simulink with built-in aerospace modeling capabilities (environment models, flight data visualization, etc.)

Key Topics

- System modeling and analysis in MATLAB/Simulink
- Control design with MATLAB/Simulink
- Control algorithm deployment using Real-Time Workshop

Instructor

Supported by **The MathWorks, Inc.**

Modeling of Six Degrees of Freedom: Missile and Aircraft Simulations

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

As modeling and simulation (MandS) is penetrating the aerospace sciences at all levels, this two-day course will introduce you to the difficult subject of modeling aerospace vehicles in six degrees of freedom (6 DoF). Starting with the modern approach of tensors, the equations of motion are derived and, after introducing coordinate systems, they are expressed in matrices for compact computer programming. Aircraft and missile prototypes will exemplify 6 DoF aerodynamic modeling, rocket and turbojet propulsion, actuating systems, autopilots, guidance, and seekers. These subsystems will be integrated step by step into full-up simulations. For demonstrations, typical fly-out trajectories will be run and projected on the screen. The provided source code and plotting programs lets you duplicate the trajectories on your PC (requires FORTRAN or C++ compiler). With the supplied textbook, *Modeling and Simulation of Aerospace Vehicle Dynamics*, and the prototype simulations you can build your own 6 DoF aerospace simulations.

Key Topics

- Introduction to modeling with tensors
- Kinematics and dynamics of 6 DoF aerospace vehicles
- Integration of aircraft and missile subsystems: Aerodynamics, propulsion, actuating, autopilots, guidance, and seekers
- Demonstration of aircraft and missile 6 DoF simulations in FORTRAN and C++
- Instructions for building your own 6 DoF simulations

Instructor

Peter H. Zipfel, University of Florida

Multidisciplinary Systems

Optimal Design in Multidisciplinary Systems

Scheduled

11–12 September 2010 • Fort Worth, TX

Held in conjunction with the 13th AIAA/ISSMO Multidisciplinary Analysis Optimization Conference and the 10th AIAA Aviation Technology, Integration, and Operations (ATIO) Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

When you are designing or evaluating a complex system such as an aircraft or a launch vehicle, can you effectively reconcile the multitude of conflicting requirements, interactions, and objectives? This course discusses the underlying challenges in such an environment, and introduces you to methods and tools that have been developed over the years, by presenting you with a review of the state-of-the-art methods for disciplinary optimization. You will learn how to evaluate sensitivity of the design. From that disciplinary level foundation, the course will take you to system level applications where the primary problem is in harmonizing the local disciplinary requirements and design goals to attain the objectives required of the entire system, and where performance depends on the interactions and synergy of all its parts. The course will give you a perspective on emerging methods and development trends.

Key Topics

- Optimization methods
- Efficient methods to compute sensitivity
- Approximation concepts
- Decomposition in design
- Soft computing methods in optimal design
- Reliability-based design optimization

Instructors

Jaroslaw Sobieski, NASA Langley Research Center
Prabhat Hajela, Rensselaer Polytechnic Institute

Registration

	By 16 August 2010	After 16 August 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Parallel-Vector/Cache Algorithms/Software for Large-Scale Finite Element Computation

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The purpose of this course is to provide engineers and applied scientists with a thorough knowledge of SPARSE serial/parallel computing methods for use in structural analysis, and with other engineering/science applications. Attendees will gain a working knowledge of basic parallel computing techniques and obtain a firm grasp on state-of-the-art algorithms for solving systems of "SPARSE equations," generation, and "SPARSE assembly" of element stiffness matrices. The parallel processing methods can be used for aerospace, automotive, civil, mechanical, and ship structure problems as well as in computer science and applied mathematics.

Key Topics

- Simple MPI/FORTRAN examples for parallel computation
- Parallel-vector "variable bandwidth" algorithms
- Massively parallel-vector equation solvers
- Symmetrical sparse equation "solver" algorithms
- Symmetrical sparse equation "assembly" algorithms
- Parallel domain decomposition formulations

Instructor

Duc T. Nguyen, Old Dominion University

Nuclear Propulsion

Nuclear and Future Flight Propulsion: Nuclear Systems and How They Work

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course includes five lectures on different topics in advanced nuclear space propulsion. A short overview is provided on the wide breadth of advanced nuclear concepts, ranging from fission, fusion, antimatter, etc. The remaining four lectures focus on nuclear system design, construction, and operation for missions throughout the solar system. These presentations will include Radioisotope Thermoelectric Generators (RTGs), nuclear spacecraft options and configurations, reactor design, and a basic overview of nuclear energy systems.

Key Topics

- Introduction
- Overview of all advanced nuclear propulsion
- Overview of nuclear energy systems
- Reactor design
- Radioisotope Thermoelectric Generators (RTGs)
- Nuclear spacecraft options and configurations

This course is organized under the auspices of the AIAA Nuclear Propulsion Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

Bryan A. Palaszewski, NASA Glenn Research Center

Plasmadynamics and Lasers

Fundamentals and Applications of Plasma Physics

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course will provide an introduction to plasma physics enabling an understanding of basic plasma processes and insight into a wide variety of ongoing research. Beginning with a discussion of the fundamental properties and characteristics of plasmas, the first day of the course then addresses techniques for plasma generation and numerical simulation. Emphasis is placed on low-temperature plasmas associated with such applications as aerodynamic flow control, plasma propulsion, and plasma processing. The first half of day two integrates the material from day one into a discussion of flow control applications which are currently of significant interest. In the afternoon, additional applications such as ignition and combustion stability, plasma propulsion, and microwave plasma generation will be discussed. These may be tailored to meet the interests of participants given sufficient notification. The course concludes with a brief overview of plasma diagnostics and modeling capabilities.

Key Topics

- Fundamental plasma parameters and governing equations
- Plasma generation techniques
- Numerical simulation of plasmas
- Applications for plasma-based flow control
- Overview of plasma diagnostics

This course is organized under the auspices of the AIAA Plasmadynamics and Laser Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

George J. Williams, NASA Glenn Research Center

High Power Lasers: Theory and Applications

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This short course presents a broad range of high power lasers and their applications. The course begins with an overview, discusses the basic theory of lasers, important optical parameters, simple laser theories, and important types of optical resonators. However, most of the course is devoted to the presentation of the many exciting types of high power (both high energy and short pulse) lasers in existence. For the larger types of gas lasers, a systems perspective is additionally presented to provide an understanding of how the many complex pieces of these systems fit together into an integrated whole. The course will finish with a discussion of some of the intriguing advanced laser concepts that are presently being developed.

Key Topics

- Laser Applications
- Laser Fundamentals and Theory
- Types of Lasers
- Laser Safety
- Future of Lasers

This course is organized under the auspices of the AIAA Plasmadynamics and Lasers Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

Wilhelm Behrens, Northrop Grumman Corporation

Propellants and Combustion

Combustion and Emission in Aircraft Engines

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Man-made emissions generated on Earth's surface are emitted into the atmospheric boundary layer up to one kilometer. A lot returns to the surface through deposition. Aircraft are the only high-altitude man-made source of emissions. The NOx emissions from aircraft produce ozone (a strong greenhouse gas). The aircraft engine emission is unique because air traffic growth rate, greater influence of high-altitude pollutants emission than those at the ground level, and increasing engine operating conditions of modern highly efficient gas turbine engine designs tend to increase the quantity of NOx per unit of fuel consumed. The increasingly stringent regulations by ICAO remain the major driving force for civil aircraft gas turbine combustion research. A solid understanding of the fuel combustion and design issues in gas turbine combustors and the mechanism of pollutant formations and their reduction strategies are main objectives of this seminar.

Key Topics

- Fuel, air, and combustion thermodynamics and chemistry
- Flame, stirred reactor theory, (combustion, thermal, propulsion) efficiencies
- Combustion in gas turbine engines
- Ignition
- Example of a simple design methodology
- Near-term and long-term trends in combustor design

This course is organized under the auspices of the AIAA Propellants and Combustion Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

Bruce Chehroudi, ERC

Dynamics of Combustion Systems: Fundamentals, Acoustics and Control

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course is intended to provide the background and technical foundation for understanding combustion instabilities in all types of combustion systems. Examples and case histories of problems in solid rockets and liquid-fueled systems provide practical motivations for the basic material covered. Much of the course is concerned with the interpretation of physical behavior using approximate methods of analysis for linear and nonlinear phenomena. The basic equations of motion are carefully derived in forms specially suited to treat combustion instabilities. Fundamentals of acoustics and adaptations to combustion systems are explained. Formulation and results of numerical simulations are discussed for solid rockets and liquid-fueled systems. Potential applications and experience with both passive and active control are thoroughly discussed and illustrated with examples.

Key Topics

- Introduction and historical background
- Fundamentals of acoustics
- Linear and nonlinear combustion instabilities
- Numerical analysis and simulations of combustion instabilities
- Passive and active control of combustion instabilities

Instructors

Fred E. C. Culick, California Institute of Technology
Vigor Yang, Pennsylvania State University

Reliability

Fundamentals of Non-Deterministic Approaches

Scheduled

10–11 April 2010 • Orlando, FL
Held in conjunction with the 51st AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, the 18th AIAA/ASME/AHS Adaptive Structures Conference, the 12th AIAA Non-Deterministic Approaches Conference, the 11th AIAA Gossamer Systems Forum, and the 6th AIAA Multidisciplinary Design Optimization Specialist Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

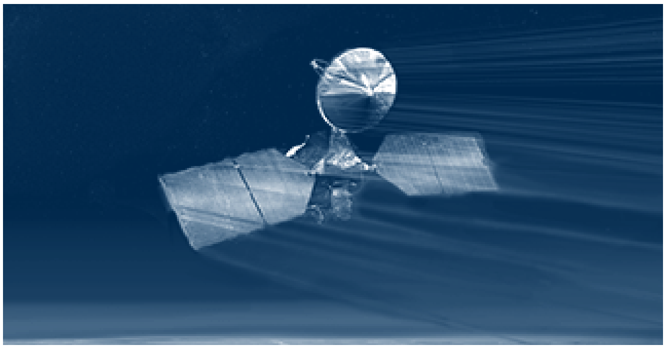
This course is offered as an overview of modern engineering methods and techniques used for modeling uncertainty. Fundamentals of probability and statistics are covered briefly to lay the groundwork, followed by overviews of each of the major branches of uncertainty assessment used to support component- and system-level life cycle activities, including design, analysis, optimization, fabrication, testing, maintenance, qualification, and certification. Branches of Non-Deterministic Approaches (NDA) to be covered include fast probability methods (e.g., FORM, SORM, Advanced Mean Value, etc.), simulation methods such as Monte Carlo and importance sampling, surrogate methods such as response surface, as well as more advanced topics such as system reliability, time-dependent reliability, probabilistic finite element analysis, and reliability-based design. An overview of emerging non-probabilistic methods for performing uncertainty analysis will also be presented.

Key Topics

- Uncertainty and its role in engineering design and analysis
- Fundamentals of probability and statistics including distribution selection
- Classical and modern structural reliability including simulation methods
- Surrogate models such as response surface and Kriging
- Reliability-based design and optimization
- Non-probabilistic methods

Instructors

Sankaran Mahadevan, Vanderbilt University
Ramana V. Grandhi, Wright State University
Michael P. Enright, Southwest Research Institute
Ben H. Thacker, Southwest Research Institute



Registration

	By 15 March 2010	After 15 March 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Satellite Design, Integration, and Test

Advanced Communication Satellites

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course, as taught by Dr. Joseph N. Pelton and Dr. David R. Smith, presents in an intensive three-day format the key elements of new technology and innovative systems analysis required for the design of advanced communications systems. There will be a special emphasis on on-board switching, on-board signal processing and signal regeneration, as well advanced antenna design for broadband digital (i.e., IP-based) services. The instructors will also cover the most important new technologies associated with next generation satellite systems and beyond. There is also special emphasis on advanced modulation, encoding and multiplexing systems including TDMA, CDMA, and the use of spread spectrum for anti-jamming purposes.

Instructor

Joseph N. Pelton, George Washington University

Fundamentals of Satellite Thermal Control

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The goal of this course is to provide a basic understanding of spacecraft thermal design, describing active and passive hardware and the thermal analysis tools used in the aerospace industry. It is designed to present a complete overview of satellite thermal control.

Key Topics

- Overview of Thermal Control Systems (TCS)
- TCS design
- Thermal control hardware
- TCS analysis
- Thermal testing and verification
- Related thermal topics

Instructors

William D. Fischer, The Aerospace Corporation
David G. Gilmore, The Aerospace Corporation
John W. Welch, The Aerospace Corporation
Tung T. Lam, The Aerospace Corporation

Satellite Communications Technologies, and Emerging Services and Markets

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course provides an integrated and up-to-date view of satellite technologies, key technical trends, shifting satellite applications and services, major market trends, and regulatory and trade regulations in the global satellite industry—commercial and defense related. Key technical concepts for FSS, MSS, and BSS satellite services will be covered, including antennas, modulation, multiplexing techniques, encoding, TTC&M, link budgets, orbits and launch services, VSATs, and teleports. Major new applications and services in the fixed, mobile, and broadcasting satellite fields will be covered, including IP based services, DVB-RCS and DOCSIS standards, and military and defense related satellite systems. Finally, the course will cover key regulatory, standards, and trade innovations that are impacting satellite markets. Two of the most experienced instructors in the field will cover the satellite field in its entirety—technology, services, markets, and regulation—with detailed handouts and useful texts for additional reading.

Key Topics

- Key technical concepts for FSS, MSS, and BSS satellite services (covering antennas, modulation, multi-plexing techniques, encoding, TTC&M, and link budgets, as well as orbits and launch services)
- Innovations in VSAT, USAT, and teleport systems
- Major new applications and services in the FSS and broadband FSS field, with special emphasis on IP based services, DVB-RCS, and DOCSIS
- Important market trends for broadcast satellite services and key drivers
- Significant market trends for land, maritime, and aeronautical mobile satellite services, as well as for military and defense related satellite systems
- Key regulatory, standards, and trade innovations that are impacting satellite markets

Instructors

Edward Ashford, Ashford Aerospace Consulting
Joseph N. Pelton, George Washington University

Spacecraft Design and Systems Engineering

NEW

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course presents an overview of factors that affect spacecraft design and operation. It begins with an historical review of unmanned and manned spacecraft, including current designs and future concepts. All the design drivers, including launch and on-orbit environments and their effect on the spacecraft design, are covered. Orbital mechanics is presented in a manner that provides an easy understanding of underlying principles as well as applications, such as maneuvering, transfers, rendezvous, atmospheric entry, and interplanetary transfers. Considerable time is spent defining the systems engineering aspects of spacecraft design, including the spacecraft bus components and the relationship to ground control. Design considerations, such as structures and mechanisms, attitude sensing and control, thermal effects and life support, propulsion systems, power generation, telecommunications, and command and data handling are detailed. Practical aspects, such as fabrication, cost estimation, and testing, are discussed. The course concludes with lessons learned from spacecraft failures

Key Topics

- History
- Design drivers
- Orbital mechanics and trajectories
- Systems engineering
- Design considerations
- Estimation, testing, and failure prevention

Instructor

Don Edberg, California State Polytechnic University, Pomona

Spacecraft Thermal Control

Scheduled

1 December 2010–30 April 2011

Course Synopsis

This course is concerned with spacecraft thermal control. The basic elements of thermal control systems are discussed. Analytical and numerical techniques which support the thermal design of spacecraft are developed. A disk is provided with numerous thermal equations programmed using Microsoft Excel.

Key Topics

- Thermal control components
- Thermal subsystem design
- Thermal analysis concepts
- Spacecraft thermal environments
- Preliminary design process

Instructor

Robert K. McMordie, (ret.) Lockheed Martin Corporation

Registration

	By 1 November 2010	After 1 November 2010
AIAA Member	$1140	$1250
Nonmember	$1240	$1350

Sensor Systems

Radar Principles and Applications

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

A two or three-day short course on radar principles and applications is proposed. The course content includes a review of the required background material, the introduction of basic radar theory and techniques, and discussion of several radar systems and applications. The course is self-contained in that all of the background material is included. The material is suitable for anyone having some calculus and a calculus based physics course.

Key Topics

- Concepts are introduced with both mathematical explanations and graphical illustrations. Therefore students without a strong math background can grasp the physical principles.
- There are an extensive number of worked examples.
- Some software is also provided to work examples.

Instructor

David Jenn, U.S. Naval Postgraduate School

Sensor Systems and Microsystems: From Fabrication to Application

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The introduction of sensor technology, including smart microsensor systems, into aerospace applications is rapidly expanding to allow improved system monitoring and provide gains in efficiency, performance, critical data, and safety. This short course is taught by three experts in sensor technology and its application to provide not only an overview of microsensor fabrication and development, but also a practical discussion of the implementation of sensor systems in space applications.

Key Topics

- Silicon-based microfabrication techniques including lithography, oxidation/ diffusion processes, etching processes, and thin film deposition
- Sensor packaging and wafer bonding techniques
- Case studies in sensor development, especially chemical sensor development, including a range of lessons learned and application examples
- Basic procedures and steps associated with flight qualification and deployment of sensors and sensor systems
- Examples of sensor system characterization and implementation on the Space Shuttle and International Space Station with lessons learned
- Discussion of future directions in sensor technology including smart sensors systems, nanotechnology, and applications in harsh environments

Instructors

Gary Hunter, NASA Glenn Research Center
Peter Hesketh, Georgia Institute of Technology
Larry Dungan, NASA Johnson Space Center

Solid Rockets

Advanced Solid Rocket Technologies

Scheduled

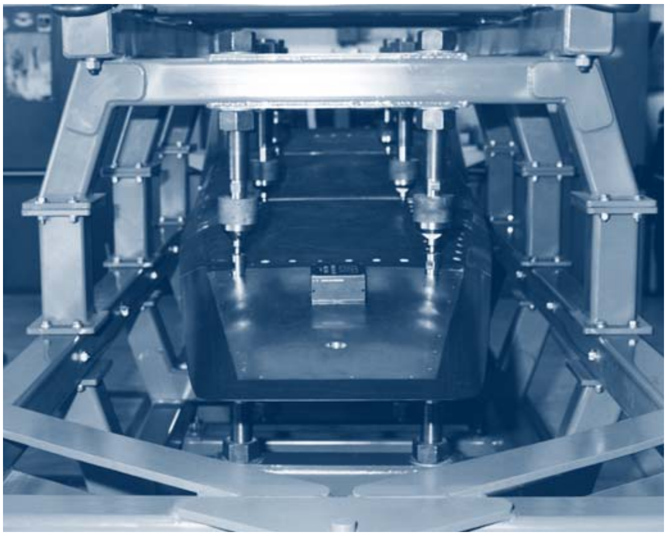
UPDATED!

29–30 July 2010 • Nashville, TN
Held in conjunction with the 46th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

Solid propulsion is vital to tactical, space, strategic and launch vehicles. The course examines fundamental and advanced concepts related to solid rockets. Theoretical and practical aspects of the field are covered. This course is based on the "Advanced Solid Rocket Propulsion" graduate-level mechanical



engineering course taught at the University of Alabama at Huntsville (UAH). All instructors are experienced solid rocket experts and many were involved with the UAH course. The individual presentations included in this short course include broad rocket motor and system design principles, internal ballistics modeling, propellant fundamentals, component design (motor case, nozzle, and igniters), component and motor manufacturing, combustion instability, and motor failures.

Key Topics

- Solid Rocket Motor Design and System Optimization
- Solid Rocket Component Design
- Solid Rocket Manufacturing

This course is organized under the auspices of the AIAA Solid Rockets Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

David Poe, Aerojet

Registration

	By 28 June 2010	After 28 June 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Space Environment

Space Environment and Its Effects on Space Systems

NEW

Scheduled

26–27 September 2010 • Anaheim, CA

Held in conjunction with the AIAA SPACE 2010 Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course on the space environment and its effects on systems is intended to serve two audiences. Firstly, those relatively new to the design, development and operation of spacecraft systems. Secondly, those experts in fields other than the space environment who wish to obtain a basic knowledge of the topic. The topics and their depth are adequate for the reader to address the environmental effects on spacecraft instruments or systems to at least the conceptual design level.

Key Topics

- Spacecraft failures
- Solar system overview
- Earth's magnetic field
- Earth's neutral environment
- Earth's plasma environment
- Radiation interactions
- Contamination
- Meteorites and orbital debris

Instructor

Vincent Pisacane, U.S. Naval Academy

Registration

	By 30 August 2010	After 30 August 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Space Environment and Spacecraft Environmental Hazards

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Space isn't just empty space. It poses an array of problems for spacecraft, which this course will help you understand and overcome. You will learn how the space environment interacts with spacecraft and their subsystems and how these adverse interactions can be mitigated. Newcomers to the aerospace industry will gain an appreciation for the hazards of the space environment. Experienced engineers will see how changing system design parameters, or orbital characteristics, affect interactions. Everyone will gain knowledge of new problem-solving techniques and design guidelines.

Key Topics

- How various interactions are related to specific orbital environments and engineering design parameters
- The fundamental physics governing the basic interactions
- The terminology and parameters used to describe the different space environments
- The potential for adverse interactions between the spacecraft and its orbital environment
- How the space environment physically interacts with space systems, and what methods to use to estimate the magnitude of these interactions

Instructors

Ronald Lukins, Measurement Analysis Corporation
Alan C. Tribble, Rockwell Collins

The Space Environment—Implications for Spacecraft Design

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course is designed to provide an introduction to the subject of spacecraft-environment interactions, also known as space environments and effects or space weather effects. The course addresses each of the major environments: vacuum, neutral, plasma, radiation, and micrometeoroid/orbital debris. In each section, the basic physics behind the environment is reviewed but the emphasis is on quantifying the magnitude of the various interactions and identifying mitigation techniques and design guidelines.

Key Topics

- Vacuum Environment Effects–Solar UV Degradation and Contamination Control
- Neutral Environment Effects–Aerodynamic Drag, Atomic Oxygen Erosion, Glow
- Plasma Environment Effects–Spacecraft Charging and Arc Discharging
- Radiation Environment Effects–Total Dose and Single Event Effects
- Micrometeoroid/Orbital Debris Effects–Hypervelocity Impact Damage

Instructor

Alan C. Tribble, Rockwell Collins

Space Operations and Support

Basic Fluids Modeling with Surface Evolver

Scheduled

26–27 June 2010 • Chicago, IL

Held in conjunction with the 27th AIAA Aerodynamics Measurement and Ground Testing Conference, the 28th AIAA Applied Aerodynamics Conference, the 5th Flow Control Conference, the 40th Fluid Dynamics Conference and Exhibit, the 10th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, and the 41st Plasmadynamics and Lasers Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

The free Surface Evolver code has powerful unique capabilities for capillary fluids. Unfortunately, many have downloaded the code, run the fluids demos, and then are unable to advance to solving real problems in new geometries. In this short course Professor Collicott teaches how to be productive with Surface Evolver on your own. He aims to lead you up the "learning curve" for the code for a new era of productivity in science and engineering. The course teaches methods for the creation of new 3-D geometry definitions including defining contact angle, symmetry boundaries, and diagnostic quantities. Methods for effective use of the code in new geometries, including assessing convergence, outputting desired data, and methods to adapt default volume, area, etc., computation methods to unique geometries are covered. Modeling axisymmetric and 2-D geometries is also taught.

Key Topics

- Instruction in learning to use the powerful Surface Evolver code for original work
- Creation of new geometry files for original work with Surface Evolver
- Demystifying the vector calculus definitions in the Surface Evolver manual.
- Capillary stability and critical wetting phenomena
- Energy-based investigations in capillary fluid physics
- Review of validation tests of Surface Evolver–why we know it is working

Instructor

Steven Collicott, Purdue University

Registration

	By 31 May 2010	After 31 May 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Space Systems

Pressure Hardware Analysis and Testing Verification Guide

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Pressure vessels (PVs) are some of the most critical components used in space systems from a safety and mission reliability point of view. Before 1998, all space flight PVs were designed, analyzed, and qualified per MIL-STD-1522A. In 1995, industry started to develop standards to replace 1522A. In 1998, AIAA S-080, which establishes the requirements for metallic PVs, was published. A sister standard, AIAA S-081, which sets forth requirements for composite overwrapped pressure vessels (COPVs), was released. However, S-080 and S-081 and ISO 14623 only specify "what-to-do," not "how-to-do." This short course provides guidance for the implementation of these standards. Important inclusions are leak-before-burst demonstrations for metallic pressure vessels and metallic liners for COPVs, impact damage tolerance test procedures for COPVs, general vibration tests for pressure vessels, and qualification by similarity conditions.

Key Topics

- Strength/stiffness
- Fatigue, damage tolerance life, and stress rupture life
- Leak-before-burst failure mode
- Design verification analyses/tests
- Acceptance and qualification test program
- Operation, maintenance, repair, and refurbishment

Instructors

James Chang, The Aerospace Corporation
Joseph Lewis, NASA JPL
Lorie Grimes-Ledesma, NASA JPL

Space Systems Fundamentals

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course provides an overview of the fundamentals of concepts and technologies of modern spacecraft systems. Space systems combine engineering, science, and external phenomena. We concentrate on scientific and engineering foundations of spacecraft systems and interactions among various subsystems. Examples show how to quantitatively estimate various mission elements (such as velocity increments) and conditions (equilibrium temperature) and how to size major spacecraft subsystems (propellant, antennas, transmitters, solar arrays, batteries). Examples enable understanding of the systems selection and trade-off issues in the design process. The fundamentals of subsystem technologies provide an indispensable basis for system engineering. The basic nomenclature, vocabulary, and concepts will make it possible to converse with understanding with subsystem specialists. The course is designed for engineers and managers—of diverse background and varying levels of experience—who are involved in planning, designing, building, launching, and operating space systems and spacecraft subsystems and components.

Key Topics

- Space environment and interactions
- Orbital mechanics and space mission geometry

- Space mission design overview
- Space propulsion, rocket dynamics, and launch systems
- Attitude determination and control
- Communications, power, and thermal control subsystems

Instructor

Michael Gruntman, University of Southern California

Space Transportation

Introduction to Space Flight

Scheduled

1 February 2010–31 July 2010

Course Synopsis

By the time you finish this course, you will be able to plan a geocentric or interplanetary mission to include the determination of suitable trajectories, the approximate velocity budget (the energy required), the approximate weight (mass) and number of stages of the booster, and the problems and options associated with the terminal phase(s) of the mission. You'll learn fundamental concepts and analytical expressions. And all you will need is a hand calculator. The emphasis throughout the course will be on fundamental concepts and analytical expressions rather than on "cookbook" and detailed numerical solutions. In consonance with the idea of emphasizing concepts and fundamentals, all exercises and problems can be solved with a hand calculator. However, students will be free to use spreadsheets or other computer solutions of their choice.

Key Topics

- The relevant two-body Newtonian equations of motion
- Geocentric orbits, their parameters and characteristics
- Inter-orbital transfers and interplanetary transfers and trajectories
- Rocket propulsion fundamentals and parameters
- Planetary flybys and gravity-assisted trajectory corrections
- The ballistic missile problem

Instructor

Francis Joseph Hale, North Carolina State University

Registration

	By 1 January 2010	After 1 January 2010
AIAA Member	$1095	$1200
Nonmember	$1195	$1300

Structural Dynamics

Automated Modeling and Simulation of Dynamic and Control Systems Using the Bond Graph Method in Aerospace Applications

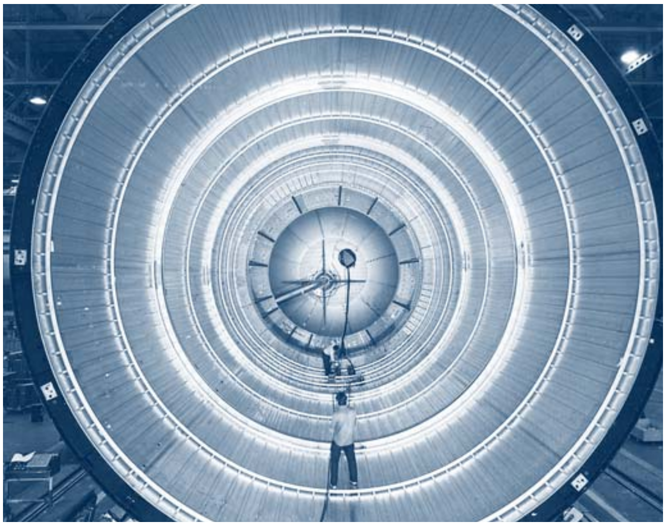
NEW

Scheduled

31 July 2010–1 August 2010 • Toronto, Ontario, Canada

Held in conjunction with the AIAA Guidance Navigation and Control Conference, the AIAA Modeling and Simulation Technologies Conference, the AIAA Atmospheric Flight Mechanics Conference, the AIAA Astrodynamics Specialist Conference, and the AIAA Atmospheric Space Environments Conference

***FREE CONFERENCE REGISTRATION**



Course Synopsis

In the process of designing dynamic and control systems, a computer model of reality is necessary. One of the first challenges is to find the equations of motion, the transfer function and the description of a system in such a way that computer simulation can be done. The task becomes more complex when systems have combinations of mechanical, electrical and hydraulic systems. This short course is intended to introduce the attendants to a computer aided modeling method using Bond Graph models and software that aids the engineer to generate computer simulation models quickly and precisely while at the same time automate the process. Automated generation of linear and non-linear models of systems automatically will be presented. The software used will be the Computer Aided Modeling Program (CAMPG), which generates models in source code form so that they can be automatically transferred to MATLAB and Simulink for simulation.

Key Topics

- Introduction to modeling of mechanical, electrical, electromechanical, hydraulic and thermal systems
- Automatic generation of differential equations
- Automatic generation of transfer functions and state space form
- Modeling with the software CAMPG
- Simulation with the MATLAB/Simulink programs
- Integrating automatically generated plant models in control systems

Instructor

Jose Granda, California State University, Sacramento

Registration

	By 5 July 2010	After 5 July 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Higher-Order Spectral Analysis Background and Applications in the Fields of Fluid Mechanics, Structural Dynamics and Structural Health Monitoring

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

One of the most applied procedures for data analysis is the estimation of the power spectrum which yields energy distribution amongst frequency components. Yet, more information in stochastic and deterministic signals can be obtained from the higher-order spectral moments. These moments can be used to identify nonlinearly interacting components in a signal which inspires the idea of proposing them as tools for the analysis, interpretation, and modeling of random time series data as measured or numerically generated from linear and nonlinear systems. The objective of this course is to show how additional information obtained from higher-order spectral analysis can be used to characterize and/or model nonlinear physical phenomena. Similarities in terms of exploitation of nonlinear aspects, nonlinear system identification and development of reduced-order models across many disciplines are discussed. The intent is to enable the students to build a perspective on how to apply higher-order spectra to their own research areas.

Key Topics

- Fourier transform, auto and cross-power spectra
- Bispectrum and quadratic nonlinearities
- Trispectrum and cubic nonlinearities
- Nonlinear system identification
- Examples and applications
- Wavelet-based higher order spectral moments

Instructors

Muhammad Hajj, Virginia Polytechnic Institute
Walter A. Silva, NASA Langley Research Center

Robust Aeroservoelastic Stability Analysis

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course will introduce the concept of robustness to the study of flutter and aeroservoelasticity. The models that are traditionally used for stability analysis are augmented with uncertainties to reflect potential errors and unmodeled dynamics. The mu method is developed to directly account for these uncertainties. The resulting robust stability margin is a worst-case measure of the smallest flutter speed for the system as effected by any of the uncertainty values. This course demonstrates the procedure for formulating a model in the mu framework and computing the associated robust stability margin. Furthermore, the course discusses methods to compute uncertainties in the models based on flight data analysis. Several applications from recent flight tests are presented for which the mu method was used to compute robust aeroservoelastic stability margins.

Key Topics

- State-space modeling of flutter and aeroservoelasticity
- Considering uncertainty in open-loop and closed-loop models
- Using flight data to identify models and associated uncertainty
- Computing robust flutter margins

Instructors

Marty Brenner, NASA Dryden Flight Research Center
Richard C. Lind, University of Florida

Structural Dynamics in Mechanical Design

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Aerospace engineers must understand the correct processes for evaluating product designs on the basis of dynamic loading. They need to know under what conditions various shock and vibration environments pose risk to a design and how to integrate dynamic analysis into the plethora of other critical design processes. This course is designed to provide the student with a good theoretical—as well as practical—knowledge of the methodologies for performing dynamic analysis on a wide range of structural and mechanical systems. Throughout the course, equal attention will be given to both the methods of classical analysis techniques and the theories on which the methods are based.

Key Topics

- Dynamic Loads and Boundary Conditions
- Foundational Topics in Energy Methods
- Newtonian Dynamics: First- and Second-Order Systems
- Multiple-Degree-of-Freedom (MDOF) Systems
- Dynamic Response of MDOF Systems
- Dynamics in the Mechanical Design Process

Instructor

Dennis Philpot, Alliant Techsystems

Structures

Aeroelasticity: State-of-the-Art Practices

Scheduled

10–11 April 2010 • Orlando, FL
Held in conjunction with the 51st AIAA/ASME/ASCE/AHS/ASC Structures, the Structural Dynamics, and Materials Conference, the 18th AIAA/ASME/AHS Adaptive Structures Conference, the 12th AIAA Non-Deterministic Approaches Conference, the 11th AIAA Gossamer Systems Forum, and the 6th AIAA Multidisciplinary Design Optimization Specialist Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

In recent years there has been a renewed interest in aeroelasticity arising from high performance aerospace systems, multiple control surface configurations, and pathologies associated with nonlinear behavior. This course provides a brief overview of aeroelasticity and examines many new “fronts” currently being pursued in aeroelasticity that include reduced-order models, integrated fluid-structural dynamic models, ground vibration testing, wind tunnel tests, robust flutter identification approaches for wind tunnel and flight test programs, and aeroservoelasticity. The course will emphasize current practices in both analytical and experimental approaches within industry and government labs, as well as advances as pursued by these organizations with the support of university research.

Key Topics

- Background
- Ground testing
- Analysis
- Aeroservoelasticity
- Flight tests
- Special topics

This course is organized under the auspices of the AIAA Structural Dynamics Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Lead Instructor

Thomas W. Strganac, Texas A&M University

Registration

	By 15 March 2010	After 15 March 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Aircraft Design Loads

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course provides details of the design loads process used in certifying FAR Part 25 aircraft. The role of the loads group in the engineering organization and its place in the design cycle are examined. The course starts with the relationship between the Federal Regulations and development of the design criteria. Basic loads processes and data requirements are introduced followed by static aeroelasticity and maneuvering loads. Dynamic loads and aeroelasticity are introduced, including unsteady aerodynamics. This is followed by discrete and continuous turbulence gust loads. Miscellaneous loads from jammed controls, engine imbalance, interaction of the structure with active systems, pressurization, and other types of miscellaneous loads are examined. An overview of repeated loads generation is presented next. Flutter analysis forms an extension to the dynamic aeroelasticity sections, and finally the course reviews some of the structural testing the loads and dynamics engineer will support.

Key Topics

- Introductions
- Data requirements
- Fundamentals
- Static loads analyses
- Dynamic loads analyses
- Testing

This course is organized under the auspices of the AIAA Structured Dynamics Technical Committee. A team of expert instructors with experience in industry, government, and academia has been formed.

Instructors

Paul F. Taylor, Gulfstream Aerospace Corporation
Doug R. McKissack, Gulfstream Aerospace Corporation
Mark E. Ray, Gulfstream Aerospace Corporation

Composite Material Structures and Viscoelasticity: Theory and Applications

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This is an integrated short course in material behavior and stress analysis of composite and elevated temperature aerospace structures, including theory, problem solving, and material property determination experimental protocols.

Key Topics

- Description of composites materials and their constituents
- Fundamentals of anisotropic elasticity
- Static and dynamic response of composite plates and panels subjected to a variety of loads

- Use of the Theorem of Minimum Potential Energy and Hamilton's Principle
- Methods of joining composite material structures
- Material characterization and modeling of isotropic and anisotropic stress-strain relations

Instructors

Jack R. Vinson, University of Delaware
Harry H. Hilton, University of Illinois at Urbana-Champaign

Design of Aircraft Structures

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details

Course Synopsis

This course examines the latest concepts and lessons learned in design of aircraft metal and composite structures, including evolution of design criteria, structural design concepts, evolution of advanced materials, static strength, buckling, durability and damage tolerance, practical design considerations, validation, and certification. Design and analysis exercises are included to involve students in the learning process.

Key Topics

- Evolution of design criteria
- Structural design concepts
- Advanced materials
- Strength and stability
- Lessons learned
- Validation and certification

Instructor

Michael Mohaghegh, Boeing Commercial Airplane Co.

Fundamentals of Composite Structure Design

NEW

Scheduled

10–11 April 2010 • Orlando, FL

Held in conjunction with the 51st AIAA/ASME/ASCE/AHS/ASC Structures, the Structural Dynamics, and Materials Conference, the 18th AIAA/ASME/AHS Adaptive Structures Conference, the 12th AIAA Non-Deterministic Approaches Conference, the 11th AIAA Gossamer Systems Forum, and the 6th AIAA Multidisciplinary Design Optimization Specialist Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course has been developed specifically for engineers who require some fundamental understanding the structural design requirements for composites. The application of composite materials is initially discussed in terms of the constituent component material properties and manufacturing processes based on the design requirements analysis. The tailoring of structural properties through lamination and fibre orientation placement are discussed in relationship to strength of materials issues and load/deformation response. The design development of the laminate is based on design outcomes and how fibre/resin systems and ply orientation is determined to achieve these design outcomes. This seminar will briefly cover the design requirements of stress analysis for the design detail such of joints, structural stiffening against instability and other structural discontinuities. Other aspects of the seminar to be covered include environmental and longevity aspects, certification and in-service support issues.

Key Topics

- Structural Design Requirements
- Laminate Configuration Sizing and Distribution
- Structural Performance Estimation and Understanding
- Other Structural Considerations – holes, joints, ply termination
- Operational Environment Issues
- Certification

Instructor

Rikard Benton Heslehurst, University College, UNSW, Australian Defence Force Academy

Registration

	By 15 March 2010	After 15 March 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Modern Modeling of Aircraft Structure

Scheduled

NEW

10–11 April 2010 • Orlando, FL

Held in conjunction with the 51st AIAA/ASME/ASCE/AHS/ASC Structures, the Structural Dynamics, and Materials Conference, the 18th AIAA/ASME/AHS Adaptive Structures Conference, the 12th AIAA Non-Deterministic Approaches Conference, the 11th AIAA Gossamer Systems Forum, and the 6th AIAA Multidisciplinary Design Optimization Specialist Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course covers a wide variety of modeling techniques associated with modeling entire aircraft and aircraft structural components such as wings, control surfaces, spars, ribs, buckled skin, pressurized and non-pressurized fuselage shell, frames, bulkheads, cabin doors windows and honeycomb floor structure. It covers specific concepts and principles required for computer modeling whole aircraft as well as the latest trends that use intricate automated techniques such as global CFD pressure application and coincident rigid elements. This course is to provide an outline of the techniques and procedures required to determine "the correct solution" well in advance of any required correlation testing or safety determinations. This course demonstrates learned and accumulated methods used over the past 25 years as well as the application of the latest available government and commericial codes.

Key Topics

- Recognize key aircraft related modeling features required for detailed analysis and test correlation and Isolate Key Aircraft structural internal load-paths that are essential to develop accurate stress distributions

- Define appropriate aircraft boundary conditions to achieve accurate modeling solutions
- Linearize inherently non-linear aircraft structural details to achieve preliminary conservative results quickly
- Model critical component splice or doubler details
- Apply simplified methods to correlate aircraft global model stresses to strain gage results
- Interpret the "pretty color pictures" output graphics
- Judge the validity of aircraft model results
- Transition from simplified to complex less conservative aircraft models including non-linear analysis
- Judge the validity of aircraft model results

Instructor

Simon Fevola, New Piper Aircraft Corporation

Registration

	By 15 March 2010	After 15 March 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Systems Engineering

Requirements and Modeling

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This tutorial presents techniques and provides essential principles to develop a structured set of complete and consistent requirements for a system. It discusses how special techniques structure system requirements to system utility, performance, and cost, thereby helping to organize and analyze requirements to fix requirements problems. It also covers the use of an overall document tree to structure the different sets of requirements and supporting information, such as the concept of operations, mission needs statement, requirements documents, scenarios, and test plans essential to proper system requirements. Additional presentations include specification development strategies, system architecture and requirements, use of architecture frameworks, operational requirements, a requirements document and its relationship to downstream requirements, development of a concept of operations, and planning and execution and management of system requirements.

Key Topics

- Systems may be characterized from operational and system requirements, model, or design perspectives; these perspectives must be aligned for proper development

- System, architecture views provide a unifying framework for these perspectives
- Modeling and evaluation of architectures are key to the proper specification and flowdown of system requirements
- Supporting documents are necessary to ensure the requirements are correct

Instructors

James N. Martin, The Aerospace Corporation
Steven M. Heidorn, The Aerospace Corporation

System Architecture, Capability, and Technology Assessment: Return on Investment

NEW

Scheduled

26–27 September 2010 • Anaheim, CA
Held in conjunction with the AIAA SPACE 2010 Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

The course takes participants through the lifecycle of architecture development for large scale missions and the concomitant investment strategy for enabling and enhancing technology in order to realize the architecture(s) selected. Methodological formulation is accompanied by real case studies and actual data from NASA missions in each of several directorates, i.e. Exploration, Science and Aeronautics. The methodology indicates how goals and objectives are quantified; agents, resources and constraints are delineated; productivity is explicitly formulated, and how large scale optimization is accomplished. The next step also deploys optimization methods to determine temporal R&D investment profiles from need dates and required capabilities, and budget pools available for investment. This information is matched against alternative R&D proposals which purport to meet the desired capability levels, the cost and temporal profile for each R&D candidate, and the likelihood of success.

Key Topics

- Missions: goals/objectivities and productivity measures
- Task allocation and scheduling among agents subject to constraints
- Sensitivity analysis
- Technology assessment: return on investment
- Case studies and results

Instructor

Charles Weisbin, Consultant – JPL, NASA

Registration

	By 30 August 2010	After 30 August 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Systems Engineering Fundamentals

Scheduled

8–9 January 2010 • Orlando, FL
Held in conjunction with the 48th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition

31 January 2010–1 February 2010 • Nashville, TN
Held in conjunction with the U.S. Air Force T&E Days 2010

11–12 September 2010 • Fort Worth, TX
Held in conjunction with the 13th AIAA/ISSMO Multidisciplinary Analysis Optimization Conference and the 10th AIAA Aviation Technology, Integration, and Operations (ATIO) Conference

26–27 September 2010 • Anaheim, CA
Held in conjunction with the AIAA SPACE 2010 Conference and Exhibit

***FREE CONFERENCE REGISTRATION**

Course Synopsis

In today's globalized environment, manufacturing and designing companies compete for business. To be successful, companies need to practice strategies that minimize the possibility of degradation of product quality, cost overrun, schedule slippage, customer dissatisfaction, and system development failures. In this course, you will learn why we need systems engineering; the systems engineering fundamentals, including requirements analysis and development, functional analysis and allocation, and design decision analysis based on requirements; risk, opportunity and issue management throughout the development and design cycle; Integrated Master Plan/Integrated Master Schedule and Work Breakdown Structure for development and design management; technical performance measurement for measuring, tracking, and validating design; interface management across in-house disciplines, supplier, and customer; and verification and validation of your products.

Key Topics

- Requirements development and management
- Functional analysis and allocation
- Risk, opportunity and issue management
- Decision analysis
- Technical Performance Measurement
- Interface management

Instructor

John C. Hsu, The Boeing Company

Registration

Orlando, FL	By 11 December 2009	After 11 December 2009	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375
Nashville, TN	**By 4 January 2010**	**After 4 January 2010**	**On-site**
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375
Fort Worth, TX	**By 16 August 2010**	**After 16 August 2010**	**On-site**
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375
Anaheim, CA	**By 30 August 2010**	**After 30 August 2010**	**On-site**
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Systems Engineering II: Network Centric Systems Architecturing and Engineering

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Net-Centric Operations (NCO) is an environment where collaboration between platforms, systems, and devices, such as satellites, aircraft, or PDAs, is possible. The general theory and application of NCO will be introduced. Systems engineering is a critical skill required by NCO to lead the design of a complex platform that involves many individual systems. You will learn the application of System-of-Systems Engineering (SoSE) Process. Architecture-Centric, Model-Based approach is the basis for developing architecture models. You will understand a comprehensive architectural guidance for DoD Architecture Framework (DoDAF). Acceptance of the Unified Modeling Language (UML) is a step in the right direction. Systems engineers need a standard language

for analyzing, specifying, designing, verifying and validating systems. SysML may be a better answer and is an extension of UML2. You will learn UML and SysML methods. Architecture reference models will be introduced and discussed.

Key Topics

- Introduction of net-centric operations (NCO)
- System-of-systems engineering process
- Unified Modeling Language (UML)
- System Modeling Language (SysML)
- Architecture development guidance
- Architecture reference mode

Instructor

John C. Hsu, The Boeing Company

Test and Evaluation

Elements of Design of Experiments

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

Designed for the practicing engineer or scientist, this course introduces DOE—a series of tools to test more than one variable and their effects on system performance. This practical introduction compares experimental strategies—such as one factor at a time, intuition, and scenarios—to designed experiments and shows that good test design is more important than sophisticated analysis. We use practical systems engineering problems (air-to-air missile engagements, unmanned air vehicle testing) to illustrate how DOE unambiguously and efficiently identifies test conditions that cause changes in test outcomes. The graduate can design and analyze simple factorial experiments with multiple variables, knows designs to avoid (Taguchi, Plackett-Burman), and when to look for help. Students will understand why DOE is rapidly becoming the standard method of test throughout the Air Force. DOE concepts are illustrated on the computer with Resampling Stats, Excel, and Design Ease.

Key Topics

- The central challenge of test: How to test both deeply and broadly simultaneously to reduce risks of drawing incorrect test conclusions
- A definition of a designed experiment, its purposes, processes, and effects
- A survey of the successful 80 year history of DOE in science and industry
- Strategies for experimentation
- Examples where DOE has reduced the cost of testing by 30%-80% while increasing knowledge gained
- A systematic, process-based DOE design and analysis methodology that can be applied to literally any discipline where tests are conducted

Instructors

James R. Simpson, USAF, 53rd Test Management Group
Gregory Hutto, Eglin Air Force Base, 53rd Test Management Group

Experimentation, Validation and Uncertainty Analysis

Scheduled

UPDATED!

31 January 2010–1 February 2010 • Nashville, TN
Held in conjunction with the U.S. Air Force T&E Days 2010

***FREE CONFERENCE REGISTRATION**

Course Synopsis

Drs. Hugh Coleman and Glenn Steele have updated their comprehensive two-day course to include material from the 3rd edition (2009) of their award-winning book and ASME V&V20-2008: *Standard for Verification and Validation in Computational Fluid Dynamics and Heat Transfer*. The course presents experimental uncertainty analysis techniques based on (1)1995 ISO GUM, (2) 2005 Standard ASME-PTC19.1 Test Uncertainty, and (3) 2008 JCGM GUM Supplement: Evaluation of Measurement Data—Propagation of Distributions Using a Monte Carlo Method in a well-paced sequence honed in over 90 presentations at companies, research laboratories, and government institutes in the US, Canada, Europe, and South America. The course covers the planning, design, debugging, and execution of experiments used to validate a model, solve a problem, or characterize system behavior. Cases in which the experimental result is determined only once or multiple times in a test are addressed and illustrated with examples from the authors' experience.

Key Topics

- The experimental approach to solving problems
- Concepts of errors and uncertainties in measurements; calibration; levels of replication; error distributions; standard uncertainties; Type A and Type B estimates; confidence intervals
- Estimating systematic and random standard uncertainties for a measured variable; propagation of uncertainties into a result; uncertainty analysis by direct Monte Carlo simulation; effects of correlated systematic errors and correlated random errors; examples from real engineering testing situations
- General uncertainty analysis; use in planning experimental programs; comprehensive examples
- Detailed uncertainty analysis; use in designing experimental programs and in the debugging and execution phases of an experiment ; comprehensive examples
- Verification and validation (V&V) of models; uncertainties in both simulations and experiments; the methodology in ASME V&V 20: Standard for Verification and Validation in Computational Fluid Dynamics and Heat Transfer

Instructors

Hugh W. Coleman, University of Alabama in Huntsville
W. Glenn Steele, Mississippi State University

Registration

	By 4 January 2010	After 4 January 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Introduction to Joint Mission Environment Test Capability: Infrastructure for Testing in a Joint Environment

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The purpose of this tutorial is to provide test organizations, system program offices, contractors, and anyone involved in defining, planning, conducting, or analyzing the results of distributed tests with an overview of the core infrastructure for testing in a joint environment. The tutorial will provide the attendee with an overview of the Joint Mission Environment Testing Capability (JMETC)—the integration capability for distributed live, virtual, and constructive (LVC) test events. JMETC is being developed to support the acquisition community during program development, developmental testing, operational testing, interoperability certification, and Net-Ready Key Performance Parameters (KPP) testing. The overview will address JMETC's architecture, products, connectivity solutions, and ongoing activities, as well as review the completed prototype demonstrations supporting Air Combat, Land Combat, and Information Operations.

Instructor

George Rumford, JMETC

Introduction to the Capability Test Methodology: Methods and Processes for Testing in a Joint Environment

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This tutorial is to provide test organizations, system program offices, contractors, and anyone involved in requirements definition, acquisition, test, evaluation, and research and development processes with an overview of fundamental concepts and processes regarding testing in a joint environment. It will address the need for testing in a joint environment as a result of the shift to "capabilities-based" planning processes driven by the new Joint Capabilities Integration and Development System (JCIDS) and associated strategic planning guidance. An introduction will be provided to the JCIDS process and other related efforts such as the DoD Analytic Agenda and the DoD Architecture Framework. An overview of end-to-end processes for testing in a complex joint mission environment will be presented for (1) test requirements definition/characterization, (2) test planning, (3) definition and initial design specification of the required distributed live, virtual, and constructive (LVC) environment, and (4) evaluation of test results.

Instructors

Frank Gray, Kirkland Air Force Base
Andreja Brankovic, Flow Parametrics LLC

TENA and JMETC, Enabling Distributed Testing and Training

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

The Test and Training Enabling Architecture (TENA), developed as a CTEIP project to promote range interoperability and range asset reuse, is being used by the Joint Mission Environment Test Capability (JMETC) to enable prototyping demonstrations and distributed testing. The JMETC is a distributed live, virtual, and constructive (LVC) testing capability developed to support the acquisition community during program development, testing, interoperability certification, and demonstration of customer-specific Net-Ready Key Performance Parameters (KPP) requirements. JMETC provides connectivity to the Services' distributed test capabilities and simulations, as well as industry test resources. Using TENA, the JMETC has completed initial demonstrations, including Air Combat, Land Combat, and Information Operations (IO Range integration). JMETC is currently preparing to support the USAF Integrated Collaborative Environment (AF ICE) summer 2007 distributed testing event, Integral Fire 2007 (IF 07).

Instructor

Gene Hudgins, BAE Systems

Thermophysics

Computational Heat Transfer (CHT) and Thermal Modeling

Scheduled

26–27 June 2010 • Chicago, IL
Held in conjunction with the 27th AIAA Aerodynamics Measurement and Ground Testing Conference, the 28th AIAA Applied Aerodynamics Conference, the 5th Flow Control Conference, the 40th Fluid Dynamics Conference and Exhibit, the 10th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, and the 41st Plasmadynamics and Lasers Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

The CHT course provides a detailed focus on the thermal analysis process and offers a unique analysis perspective by developing the concepts around practical examples. It is a computational course dedicated to heat transfer simulation. In the treatment of the general purpose advection-diffusion (AD) equation, the course material provides a strong introductory basis in CFD. The course promotes a multistep modeling paradigm from which to base computational heat transfer analysis. Seven lectures form a close parallel with the modeling paradigm to further emphasize the concepts. The present CHT course is also designed around an array of practical examples and contemporary simulation codes, employing InterLab sessions. The course includes commercial grade meshing and analysis tools to promote continued study. The overall goal of the CHT course is to form a bond between theory and practice, emphasizing a definitive structure to the modeling process.

Key Topics

- Formulation of the basic equations of heat transfer
- Decoupling systems and deriving boundary conditions
- Discretization of the governing equations and geometry
- Computational solutions to the discrete equations
- Validation of computational models and solutions
- Special topics in heat transfer

Instructor

Dean S. Schrage, TITAN Algorithms

Registration

	By 31 May 2010	After 31 May 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Heat Transfer

Scheduled

1 December 2009–30 April 2010

Course Synopsis

The home study course "Heat Transfer" provides the basics of heat transfer along with information on numerical techniques used in heat transfer analyses. Numerous automated analyses (using Microsoft Excel) are provided on a disk including radiation view factor calculations, film coefficient computations, and fluid flow analysis. There is a large data base of thermal physical properties. Much of this data is given as a function of temperature in the form of polynomial equations.

Key Topics

- Heat Transfer Conduction
- Heat Transfer Convection
- Heat Transfer Radiation
- Numerical Techniques
- Property Value Evaluation

Instructor

Robert K. McMordie, Lockheed Martin Corporation (ret.)

Registration

	By 1 November 2009	After 1 November 2009
AIAA Member	$1095	$1200
Nonmember	$1195	$1300

Unmanned Systems

Unmanned Aviation in the 21st Century

UPDATED!

Scheduled

18–19 April 2010 • Atlanta, GA

Held in conjunction with the AIAA Infotech@Aerospace 2010 Conference

***FREE CONFERENCE REGISTRATION**

Course Synopsis

This course is ideal for those wishing to gain insight into current and emerging UAV systems, as well as those who are knowledgeable about UAVs but wish to understand the implications and opportunities of UAVs in the 21st century. Attendees will learn the history of UAV development and the basics of today's UAV technologies. They will then learn how today's UAV systems operate, the challenges facing them, and the markets in which they are and could be used. Finally, attendees will be introduced to the future of UAV systems, how they will differ in capability from those in service today, and the emerging technologies that will enable these capabilities.

Key Topics

- History and evolution of unmanned aviation
- Current U.S. UAV programs
- How unmanned aircraft systems and sensors work
- Applications and markets for UAVs
- Challenges to unmanned aviation
- Emerging technologies for aerial robotics in the 21st century.

Instructors

Laurence R. Newcome, Modern Technology Solutions, Inc. (MTSI)
Robert C. Michelson, Georgia Tech University

Registration

	By 22 March 2010	After 22 March 2010	On-site
AIAA Member	$1095	$1200	$1275
Nonmember	$1195	$1300	$1375

Weapon System Effectiveness

Introduction to Weaponeering

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course is based on a very successful graduate-level weaponeering course developed by Professor Driels and taught at the Naval Postgraduate School, Monterey, CA. The course will give an overview of the fundamentals of the weaponeering process and its application to air-to-surface and surface-to-surface engagements. The course explains the analytical basis of current weaponeering tools known as the Joint Munitions Effectiveness Manuals (JMEMs) produced by the Joint Technical Coordinating Committee for Munitions Effectiveness (JTCC/ME). The JMEMs are used by all services to plan offensive missions, and allow the planners to predict the effectiveness of selected weapon systems against a variety of targets.

Key Topics

- Part I covers the basic tools and methods used in weaponeering
- Part II covers the weaponeering process for air-launched weapons against ground targets
- Part III covers the weaponeering process for ground engagements

Instructor

Morris Driels, U.S. Naval Postgraduate School

Vulnerability of Ballistic Missiles to Near Miss Warhead Technology

Scheduled

This course in not currently scheduled but is available at any time to satisfy your on-site training needs. Contact AIAA at 866.864.2422 for details.

Course Synopsis

This course deals with the complicated subject of anti-ballistic missile defense and the associated trades of direct hit technology versus warheads. The mathematics and system trades of computing ballistic missile vulnerability is taught. Also, these vulnerability models are flown down to kill enhancement requirements, and the associated modeling techniques are provided in mathematical details. This course will provide a comprehensive understanding of how to model and design kill enhancement concept against ballistic missiles.

Key Topics

- Direct hit technology
- Modeling
- Ballistic missile vulnerability
- Kill enhancement

Instructor

Richard M. Lloyd, Raytheon Electronics Company

2009–2010 COURSE CALENDAR

DECEMBER 2009

1 December 2009–30 April 2010 • Distance Learning

Advanced Computational Fluid Dynamics
Computational Fluid Turbulence
Heat Transfer
Introduction to Computational Fluid Dynamics

JANUARY 2010

8–9 January 2010 • Orlando, FL

Best Practices in Wind Tunnel Testing
Computational Multiphase Flow
Flow Control for Specialists
Fluid-Structure Interaction
Large-eddy Simulations: Theory, Applications, and Advanced Topics
Microfluidics and Nanofluidics: Fundamentals and Applications
Modeling Flight Dynamics with Tensors
Systems Engineering Fundamentals

18–19 January 2010 • Monterey, CA

Making Decisions in Missile Defense
Tactical Missile Design – Integration

31 January 2010–1 Febuary 2010 • Nashville, TN

Experimentation, Validation and Uncertainty Analysis
Systems Engineering Fundamentals

FEBRUARY 2010

1 February 2010–31 July 2010 • Distance Learning

Fundamentals of Aircraft Performance and Design
Introduction to Space Flight

APRIL 2010

10–11 April 2010 • Orlando, FL

Aeroelasticity: State-of-the-Art Practices
Fundamentals of Composite Structure Design
Fundamentals of Non-Deterministic Approaches
Modern Modeling of Aircraft Structures
Tensegrity Systems

18–19 April 2010 • Atlanta, GA

Unmanned Aviation in the 21st Century

JUNE 2010

26–27 June 2010 • Chicago, IL

Basic Fluids Modeling with Surface Evolver
Computational Heat Transfer (CHT) and Thermal Modeling
Modern Design of Experiments
Stability and Transition: Theory, Modeling, Experiments, and Applications
Verification and Validation in Scientific Computing

JULY 2010

29–30 July 2010 • Nashville, TN

Advanced Solid Rocket Technologies
Air Breathing Pulse Detonation Engine Technology
Hydrogen Safety Course
Liquid Propulsion Systems – Evolution and Advancements
Numerical Propulsion System Simulation: A Practical Introduction
Tactical Missile Design – Integration

31 July 2010–1 August 2010 • Toronto, Ontario, Canada

Advanced Space Vehicle Control and Dynamics
Automated Modeling and Simulation of Dynamic and Control Systems Using the Bond Graph Method in Aerospace Applications
Emerging Principles in Fast Trajectory Optimization
Mathematical Introduction to Integrated Navigation Systems with Applications
Robust and Adaptive Control Theory
System Identification Applied to Aircraft–Theory and Practice

SEPTEMBER 2010

11–12 September 2010 • Fort Worth, TX

Optimal Design in Multidisciplinary Systems
Systems Engineering Fundamentals

26–27 September 2010 • Anaheim, CA

Space Environment and Its Effects on Space System
System Architecture, Capability, and Technology Assessment: Return on Investment
Systems Engineering Fundamentals

NOVEMBER 2010

14–15 November 2010 • Monterey, CA

Modern Missile Guidance

DECEMBER 2010

1 December 2010–30 April 2011 • Distance Learning

Advanced Computation Fluid Dynamics
Computational Fluid Turbulence
Introduction to Computation Fluid Dynamics
Spacecraft Thermal Control

REGISTRATION INFORMATION

Course Materials

AIAA short courses supply you with notes and presentations that cover the topics studied in the course. These charts, lists, graphics, and summaries are provided to you with invaluable resources for future reference, on the Web.

Course Fees

Course fees include tuition, online course notes, and in some cases textbooks, software, continental breakfast, and refreshments. Fees do not include hotel accommodations.

Lodging Information

You will receive hotel information with your registration confirmation letter.

FREE Conference Registration

If you attend a course held in conjunction with an conference, you will receive a free conference registration. This registration offer includes all technical and plenary sessions and exhibits. It does not include luncheons, receptions, proceedings, and/or technical papers, or any other ancillary or special functions. These items can be purchased separately at the conference.

FREE AIAA Membership

When you are registering at the nonmember rate, you will receive a complimentary one-year AIAA membership.

Pre-registration

We ask that you pre-register by fax, mail, or e-mail, but if circumstances preclude your advance registration, please call as late as one week prior to the course. This gives us time to notify you of any changes and have the proper class materials ready for you.

Registration

A check, credit card information, or corporate purchase order must accompany your registration form. We will e-mail you a confirmation letter with course details within 10 business days of receiving your registration. If you do not receive a confirmation letter by one week prior to the first day of the class, please call Daniel Medina at 703.264.7642 or e-mail danielm@aiaa.org.

Group Discounts

Deduct 5% for three or more students from the same organization, if registered simultaneously, prepaid, and registration materials are postmarked four weeks prior to the first day of the course. Please register each person on a separate form. Photocopies are acceptable.

Cancellations

Substitutions may be made at any time. Cancellations must be postmarked four weeks before the course start date and are subject to a $100 cancellation fee. If you find you must cancel four weeks or less before the course date, you will forfeit the entire fee. AIAA reserves the right to cancel any program due to insufficient registration or any situation beyond its control. Each course will be reviewed three weeks prior to the start date and may be canceled if a minimum enrollment has not been reached. Please refer to the AIAA Web site for course status. Participants will be notified immediately and a full refund will be issued. AIAA cannot be responsible for expenses incurred due to course cancellation. AIAA reserves the right to substitute speakers in the event of unusual circumstances.

Seminar Hours

Registration begins at 0730 hrs on the first day of the course. Most courses will meet from 0815 hrs until 1700 hrs each day.

Continuing Education Units (CEUs)

Upon completion of a course, attendees will receive a certificate of completion and the appropriate number of CEUs. A CEU represents 10 hours of classroom instruction and is a nationally recognized standard unit of measurement awarded for participating in qualified continuing education programs.

Important Notice About Visas

If you plan to attend an American Institute of Aeronautics and Astronautics (AIAA) technical conference or course held in the United States and you require a visa for travel, it is incumbent upon you to apply for a visa with the U.S. embassy (consular division) or consulate with ample time for processing. To avoid bureaucratic problems, AIAA strongly suggests that you submit your formal application to U.S. authorities a minimum of 120 days in advance of the date of anticipated travel.

Please visit www.travel.state.gov for more information about the visa application process and U.S. Department of State requirements.

If you plan to attend an AIAA-organized event that is being held in a country outside the United States and you require a visa to travel to that country, you must apply for a visa at an embassy or consulate of the country in which the event is being held.

Prospective conference and course attendees requiring a visa to travel to the event should first contact AIAA to request an official letter of invitation to the event. This letter and a copy of the conference Call for Papers should be presented along with the required documentation to the U.S. consular officials as part of the formal application process.

PROFESSIONAL DEVELOPMENT REGISTRATION FORM

AIAA PROFESSIONAL DEVELOPMENT — Keeping You On the Leading Edge

Please complete a separate form for each participant. Photocopies are acceptable. Please print or type.

100728CA12345

ATTENDEE INFORMATION

Prefix	First Name/Given Name	Initial	Last Name/Family Name	Suffix	Gender ❑ M ❑ F	Date of Birth / /

Company/Organization (please spell out entire name)

Primary Address (Mailing) ❑ Home ❑ Business

Address		City
State/Province	Zip/Postal Code	Country
Phone	E-mail	Fax Number

Secondary Address ❑ Home ❑ Business

Address		City
State/Province	Zip/Postal Code	Country
Phone	E-mail	Fax Number

Education Record

Highest Degree Attained	Field of Study	College or University	Year

Registered Engineer ❑ yes ❑ no State of issue______ Engineer-In-Training ❑ yes ❑ no

Issue date ___/___/___ Expiration date ___/___/___ State of issue______ Issue date___/___/___

TITLE OF PROFESSIONAL DEVELOPMENT COURSE	COURSE DATE	AMOUNT
	TOTAL	

FORM OF PAYMENT

AIAA Member Number:______________________________

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Credit Card Number:______________________________

Expiration Date:_________Month_________Year

Signature:______________________________ Date:____________

AIAA MEMBERSHIP

If you are registering for a professional development course at the nonmember rate, included with your registration fee is one year of AIAA membership. Sign below to apply for AIAA membership.

❑ Included in your AIAA membership will be periodic communications about AIAA benefits, products, and services. Check here if you prefer not to receive membership information via e-mail.

❑ From time to time, we make member information available to companies whose products or services may be of interest to you. Check here if you prefer not to have your name and address used for non-AIAA mailings.

I hereby apply for membership in the American Institute of Aeronautics and Astronautics. If elected, I agree to conform to the requirements of membership.

Signature: ______________________________ Date: ______________

❑ Check here if you are renewing or reinstating your membership. (You must pay full nonmember fee.)

MEMBERSHIP IS PERSONAL AND NOT TRANSFERABLE

Complete and mail or fax to: **American Institute of Aeronautics and Astronautics/Professional Development Programs**

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09-0624

ATTENDEE PROFILE INFORMATION

Please supply the following information. It will help us to develop membership benefits tailored to your needs.

AREAS OF INTEREST

Indicate your 3 major areas of professional interest by inserting the following codes into the boxes below.

1ST 2ND 3RD

ENGINEERING & TECHNOLOGY MANAGEMENT
- 0100 Economics
- 0105 History
- 0110 Legal Aspects of Aeronautics & Astronautics
- 0115 Management
- 0120 Society & Aerospace Technology
- 0125 Technical Information Services
- 0130 Systems Engineering
- 0135 Environmental Assurance/Compliance
- 0140 Computer-Aided Enterprise Solutions

AEROSPACE SCIENCES
- 0200 Aeroacoustics
- 0210 Applied Aerodynamics
- 0215 Astrodynamics
- 0220 Atmospheric & Space Environment
- 0225 Atmospheric Flight Mechanics
- 0235 Fluid Dynamics
- 0240 Guidance, Navigation, & Control
- 0245 Aerodynamic Measurement Technology
- 0250 Plasmadynamics & Lasers
- 0255 Sounding Rockets
- 0265 Thermophysics
- 0270 Remote Sensing & Applications
- 0275 Thermodynamics
- 0280 Computational Fluid Dynamics
- 0285 Modeling & Simulation
- 0290 Ground Testing

AIRCRAFT & ATMOSPHERIC SYSTEMS
- 0300 Air Transportation Systems
- 0305 Aircraft Design
- 0310 Aircraft Operations
- 0315 Aircraft Safety
- 0316 Balloon Technology
- 0320 General Aviation Systems
- 0325 Helicopter Design
- 0330 Lighter-Than-Air Systems
- 0335 Unmanned Systems
- 0340 V/STOL Aircraft Systems
- 0345 Marine Systems & Technology
- 0350 Multidisciplinary Design Optimization
- 0355 Hypersonic Systems
- 0360 Flight Testing
- 0365 Electronic Equipment Design
- 0370 Ground Support Equipment
- 0375 Aircraft Maintenance
- 0380 Reliability
- 0385 Test & Evaluation
- 0390 Standards Engineering
- 0395 Producibility & Cost Engineering
- 0396 Production Engineering
- 0397 Aerodynamic Decelerator Systems

INFORMATION SYSTEMS
- 0400 Aerospace Electronics
- 0405 Aerospace Maintenance
- 0410 Intelligent Systems
- 0420 Information & Command & Control Systems
- 0425 Communications Systems
- 0430 Computer Systems
- 0435 Digital Avionics Systems
- 0440 Sensor Systems
- 0445 Software Systems
- 0450 Support Systems
- 0455 System Effectiveness & Safety
- 0460 Space Logistics
- 0465 Micro/Nanotechnology

PROPULSION & ENERGY
- 0500 Aerospace Power Systems
- 0510 Electric Propulsion
- 0515 Liquid Propulsion
- 0520 Propellants & Combustion
- 0525 Solid Rockets
- 0530 Terrestrial Energy Systems
- 0535 Nuclear Thermal Propulsion
- 0540 Hybrid Rockets
- 0545 Energetic Components & Systems
- 0550 Gas Turbine Engines
- 0555 High Speed Air Breathing Propulsion
- 0560 Air Breathing Propulsion Systems Integration

SPACE & MISSILES
- 0600 Life Sciences & Systems
- 0605 Missile Systems
- 0610 Space Operations & Support
- 0615 Microgravity & Space Processes
- 0620 Space Systems
- 0625 Space Transportation
- 0630 Space Sciences & Astronomy
- 0635 Space Automation & Robotics
- 0640 Weapon System Effectiveness
- 0645 Human Factors Engineering
- 0650 Satellite Design, Integration & Test
- 0655 Launch Operations
- 0660 Laser Technology & Applications
- 0665 Space Tethers
- 0670 Space Colonization
- 0675 Space Tourism
- 0680 Terraforming
- 0685 Space Resources
- 0690 Space Architecture

AEROSPACE DESIGN & STRUCTURES
- 0701 Survivability
- 0705 Design Engineering
- 0710 Design Technology
- 0730 Meshing, Visualization & Computational Environments
- 0735 Materials
- 0745 Structural Dynamics
- 0750 Structures
- 0755 Adaptive/Smart Structures
- 0760 Radar Absorbing Materials & Structures
- 0765 Gossamer Spacecraft
- 0770 Non-Deterministic Approaches

PRIMARY BUSINESS

Indicate your company's primary business by inserting one code from below into the box at right.

AEROSPACE MANUFACTURING
- 1A Military Aircraft
- 1B Commercial Aircraft
- 1C Business & Private Aircraft
- 1D Helicopters
- 1E Missiles
- 1F Spacecraft
  - 1F2 Space Commercialization
  - 1F3 Satellites
- 1G Power & Propulsion Systems
- 1H Avionic/Electronic Components
- 1I Electro/Mechanical Systems
- 1J Hydraulic/Pneumatic Systems
- 1K Flight Controls & Instrumentation
- 1L Other Parts/Components & Subsystems

GOVERNMENT
- 2A Department of Defense
  - 2A1 U.S. Army
  - 2A2 U.S. Air Force
  - 2A3 U.S. Navy
  - 2A4 U.S. Marine Corps
- 2B Department of Energy
- 2C Department of Transportation
- 2D Department of Homeland Security
- 2E NASA
- 2F Other Government
- 2G Non-U.S. Government
  - 2G1 Non-U.S. Military

AIR TRANSPORTATION
- 3A Trunk, Regional & International
- 3B Business & General Aviation

SUPPLIERS
- 4A Materials
- 4B Engineering or Manufacturing Equipment
  - 4B1 Hardware (Computers)
  - 4B2 Software

SERVICES
- 5A Consulting or Government Service Contracting
- 5B Research & Development
- 5C Education
- 5D Science
- 6 Others Allied to the Field: ______________ *(please specify)*

JOB CATEGORY

Indicate your principal job category by inserting one code from below into the box at right.

- A1 Corporate/Senior Management
- A2 Other Management
- A3 Military
- A4 Program Management
- B1 Vice President R&D
- B2 Technical/Research Director
- B3 R&D Engineer
- C1 Vice President Engineering/Design
- C2 Project/Product Engineer
- C3 Engineering Manager
- C4 Design Engineer
- C5 Design Support
- C6 Systems Engineer
- D1 Vice President Manufacturing & Production
- D2 Industrial, Manufacturing & Production Engineer
- D3 Manufacturing & Production Engineering Manager
- E1 Sales Engineer
- E2 Engineering Information Specialist
- E3 Other Engineer
- E4 Test & Evaluation Engineer
- E6 Professor/Educator
- E7 Consultant
- E8 All Other Personnel
- FS Returned to Full-time Study
- R Retired

INDEX OF COURSES

AIAA—The World's Forum for Aerospace Leadership

For more information on the AIAA Professional Development Program, please contact:

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