

LabVIEW for Aerospace Ground and Flight Test
June 6-10, 2011

Course Description

National Instruments' LabVIEW is an extremely powerful computer programming tool for data acquisition, analysis and control applications. LabVIEW has grown quite popular in the aerospace ground and flight test community. The purpose of this course is to teach LabVIEW fundamentals while emphasizing the unique aspects of aerospace ground and flight test problems and how to best utilize LabVIEW to deal with these unique challenges.

In this course each student will be at a computer with LabVIEW and access to networked data acquisition equipment and each student will build and test Virtual Instruments (VI's) dealing with typical aerospace data processing problems which include:

- Typical aerospace data types
- How to format and decode telemetry
- How to log and playback test information
- How to decode Global Positioning Satellite (GPS) receiver messages
- Working with typical aerospace sensors and devices
- Unique aerospace data visualization tasks with LabVIEW
- Interfacing to flight simulators via networks
- Networks and Avionics Data buses
- Making sense of test data using statistics, regression analysis and digital filters in LabVIEW
- Using the internet for ground and flight test data distribution

LabVIEW is a registered trademark of National Instruments

XPlane is a trademark of Laminar Research

Each student will receive a National Instruments USB-6008 4 channel USB data acquisition device, a Student Version of LabVIEW and a LabVIEW textbook to take home with them to continue their studies.

Course Schedule

(NOTE: All Times are Central Time Zone)

Day 1

8:30 - 10:30 Introduction to LabVIEW
10:30 - 11:00 Break
11:00 - 12:30 Representing Data in Memory
12:30 - 1:30 Lunch
1:30 - 3:30 Telemetry and LabVIEW Arrays
3:30 - 4:00 Break
4:00 - 5:30 Exercise - Building and Interpreting IRIG Telemetry Frames

Day 2

8:30 - 10:30 Data Recording and Logging
10:30 - 11:00 Break
11:00 - 12:30 Data Visualization
12:30 - 1:30 Lunch
1:30 - 3:30 Introduction to Basic LabVIEW Data Acquisition
3:30 - 4:00 Break
4:00 - 5:00 Exercise - File I/O and Data Visualization
5:00 - 6:00 Exercise - Data Acquisition and USB Device

Day 3

8:30 - 10:30 Time and Space Position Information
10:30 - 11:00 Break
11:00 - 12:30 Character and String Manipulation and Basic Serial I/O with Aerospace
12:30 - 1:30 Lunch
1:30 - 3:30 Useful Algorithms Telemetry Data Compression
3:30 - 4:00 Break
4:00 - 5:30 Exercise - Decoding GPS NMEA Strings
5:00 - 6:00 Exercise - Data Acquisition, USB Device and Sensors

Day 4

8:30 - 10:30 Sound and Graphics
10:30 - 11:00 Break
11:00 - 12:30 Networks and Avionics Data Buses
12:30 - 1:30 Lunch
1:30 - 3:30 LabVIEW and Network Data

3:30 - 4:00
4:00 - 5:30

Day 5

8:30 - 10:30 Statistics and Noise
10:30 - 11:00 Break
11:00 - 12:30 Curve fitting and Regression Analysis
12:30 - 1:30 Lunch
1:30 - 3:30 Digital Filters
3:30 - 4:00 Course Critique

About the Instructor

Mr. John Muratore is a Research Associate Professor at the University of Tennessee Space Institute where he teaches Flight Test Instrumentation, Flight Test Data Processing and Systems Engineering in the Aviation Systems and Flight Research Department. He leads projects upgrading the flight and ground data systems for education and airborne scientific research at the institute using LabVIEW.

Mr. Muratore is a 28 year veteran of ground and flight test. He has served as a launch test controller for the Air Force, Instrumentation and Communications Officer flight controller in NASA's Space Shuttle Mission Control, and Space Shuttle Flight Director. Mr. Muratore led the project which delivered NASA's new Mission Control Center for Space Shuttle and the International Space Station operations. Mr. Muratore led the X-38 Project serving as Project Manager and also as Mission Director and B-52 Launch Panel Operator for X-38 flights. Following the loss of Columbia, Mr. Muratore served as Manager of Space Shuttle Systems Engineering and Integration for the Return To Flight.

Mr. Muratore has over 13 years of experience programming with LabVIEW for ground and airborne operations. Mr. Muratore is a licensed Professional Engineer in the state of Texas and is a senior member of the Society of Flight Test Engineers. He holds a Bachelors degree in Engineering and Applied Science from Yale University and a Masters degree in Computer Systems from the University of Houston.

Communications

Break

Exercise - Driving LabVIEW with XPlane Flight Simulator in Real Time

Statistics and Noise

Break

Curve fitting and Regression Analysis

Lunch

Digital Filters

Course Critique

Office of Continuing Education

Reservations may be made by using the registration form. The registration fee of \$2195.00 includes all necessary supplies. Early reservations are recommended. Refund of registration fee can be made if cancellation notice is received ten working days prior to beginning of the course. Cancellation received less than 10 working days prior to the course will be assessed 20% of the registration fee. Registration within the **10 working days prior to the course** is also subject to the same cancellation policy. Substitution may be made at any time.

Please register by mail, fax, or telephone. A telephoned, mailed, or faxed reservation made **by an official training office** is considered a firm registration and cancellation policy will apply. A letter of acknowledgment will be mailed to the individual for whom the reservation is made, or to the training office, as we are instructed. Class size will be limited to ensure optimum interaction among participants. UTSI reserves the right to cancel the course. The liability of The University of Tennessee Space Institute is limited to the registration fee. UTSI will not be responsible for airline ticket cancellation fees or any other expenses incurred because of course cancellation. Enrollees will be notified and a full refund will be made. Late applicants will be considered on a space available basis.

The course is payable in advance and includes the cost of notes, classroom material, refreshments, and lunches. The fee does not include expenses for motel accommodations or other meals. Payment may be made by check, money order, or credit card. Be sure to include attendee name(s) and course title with check. Please make checks payable to The University of Tennessee Space Institute. **VISA, MasterCard, and Discover are accepted.**

UTSI reserves the right to substitute speakers in the event of unusual circumstances. UTSI does not sell the course notes. You must attend the course in order to receive the material. Training taken to maintain or improve professional knowledge and skills is usually tax-deductible. Consult your tax advisor. **Please notify us if you require special meals, wheelchair access, or other accommodations.** Casual dress is appropriate.

Enrollment may be made by individuals or companies. Any number of persons may enroll from a single organization so long as there are vacancies. We suggest that you phone us of your intention to enroll as soon as you initiate your organization procedure so we can hold a place for you and be better able to plan the arrangements. Phone the Continuing Education Director at (931) 393-7276 and then follow with the written application.

A place in the course will be reserved for industry personnel and government employees who require time to obtain authorization. Organizations may enroll for a given number of individuals, supplying the names at a later date, if necessary. For all such enrollments or reservations, the individual names should be received by the Institute as soon as possible to ensure a place in the course. For additional applications, use separate sheet giving all particulars required on the application form.