DIGITAL SIGNAL PROCESSING FOR INSTRUMENTATION & DATA ANALYSIS

April 13 - 15, 2010

Directors:

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Course Description

This is a three day course intended for scientists and engineers involved in experimental data acquisition and analysis who wish to become familiar with recently developed methods of signal processing for use in their work. It provides a working knowledge of digital signal processing (DSP) techniques and systems with emphasis on those methods of interest in instrumentation and data analysis. Familiar applications to often-encountered experimental data types are emphasized. Examples of the DSP techniques will be given using the interactive numeric computation software package MATLAB^{R}. Numerous exercises are provided during the course workable in The Student Edition of MATLAB^{R}.

The course begins on day one with an introduction to the fundamental principles of discrete signals and DSP. The concept of frequency analysis of signals is introduced and developed to acquaint the participant with the widespread utility of this technique. Common numerical schemes such as differentiation, integration and smoothing of digitized data are examined in light of this approach. Frequency domain methods are developed further in a session on the discrete Fourier transform, including its computation via the fast Fourier transform (FFT) and its variations.

On the second day, useful techniques for performing spectral analysis of digitized data are covered in the first session. Principles of finite impulse response and infinite impulse response filtering are then addressed, and methods of filter design are presented. The second day concludes with a session where students will use computers to practice using MATLAB^{R} for implementing DSP methods and filter design techniques.

Algorithms for efficiently implementing such filters in software are covered in the first session of day three with examples used to illustrate the fundamental principles. Methods for changing the sample rate of digital signals via interpolation and decimation are then discussed along with practical schemes for A/D and D/A conversion. The course material then moves into the use of high-speed digital signal processor chips for implementing DSP methods. Typical characteristics and architectures of floating-point digital signal processors are examined along with an overview of available personal-computer-based coprocessor cards utilizing these chips. The course considers how DSP methods would be implemented in the C programming language for efficient execution on DSP chips. The course concludes with sessions on finite wordlength effects and methods for the lossless and lossy compression and restoration of digital data.

Course Fee: $1,249.00

AIAA Member Course Fee: $1,124.10

For more information and an application form, view/download the printable PDF brochure