

ITC 2009 SHORT COURSE SYNOPSIS
MONDAY, OCTOBER 26, 2009 FROM 9AM TO 5PM

BASIC SYSTEMS ENGINEERING

Instructor: Mr. Halil Altan, Honeywell Clear Water Space Division

This course studies end-to-end telemetry systems with their signal and noise characteristics. It concentrates on analysis of data streams for efficient transfers over the communication link. Sampling, filtering, commutation, and RF link characteristics are studied. Line Coding (NRZ-L, BIO-L, etc.) with their spectral (Fourier) characteristics, bandwidth and filtering requirements are analyzed. Benefits of using source coding for data transmission is explained (randomization, Forward Error Correction (FEC), Block coding, Convolutional coding, Turbo Coding concepts are covered). Modulation techniques such as AM, PCM/FM (CFSK), BPSK and QPSK are analyzed; their E_b/N_0 and BER performance characteristics are compared.

INTERMEDIATE CONCEPTS

Instructor: Mr. Tim Gatton, Wyle - Telemetry and Data Systems

This course is designed for the more experienced user. It includes a discussion of technology topics covering the entire system from Nyquist through computers, RAID, and Chapter 10 airborne and ground recorders - from signal conditioners to recorders, workstations, and software. Specific topics include systemic implementations of Nyquist and its hidden impacts, recorder architectures (both hardware and software), RAID implementations (DAS, NAS, SAN) and performance issues of Windows and Unix system architectures, Range Communications, and the use of the new Chapter 10 Data formats, with a review of how the new iNET architecture will impact the ranges through 2025..

IMAGE COMPRESSION WITH JPEG 2000

Instructor: Dr. Michael W. Marcellin, University of Arizona

Provides a half-day overview of image compression fundamentals, followed by a half-day overview of JPEG 2000. Compression fundamentals to be covered include: entropy, Huffman coding, context coding, adaptive coding, discrete cosine transform (DCT), and wavelet transform. JPEG 2000 is the latest ISO standard for image compression. It is being adopted in many applications including medical imaging, wide area persistent surveillance, and digital cinema, to name a few. The overview of JPEG 2000 will focus on features and functionality, as well as the underlying algorithms. Numerous examples and demos will be included.

BASIC SIGNALS AND MODULATION

Instructor: Dr. Steve Horan, New Mexico State University

This course is directed towards beginning technical personnel or telemetry personnel with limited experience in communications and modulation systems. The course will cover basic concepts necessary to understanding the data communications process within the telemetry system. This will include signal descriptions, the Pulse Code Modulation (PCM) process, concepts of analog and digital modulation and demodulation, and signal

bandwidth representations. Emphasis will be on graphical representations with minimal mathematical requirements.

ADVANCED MODULATION & DEMODULATION TECHNIQUES FOR TELEMETRY

Instructor: Mr. Terry Hill, Quasonix, LLC.

Explores modulation techniques currently employed or proposed for telemetry. Material covers the legacy PCM/FM waveform, SOQPSK, and Multi-h CPM. Demodulation techniques for these waveforms are also addressed with particular emphasis on synchronization techniques and performance.

PRINCIPLES OF TELEMETRY GROUND STATION ANTENNAS, POSITIONERS AND CONTROLLERS

Instructor: Mr. George R. Blake, Orbit Communications Systems, Inc.

This course is designed for Electronic Technician and Engineering level personnel who have some working knowledge and hands-on experience with Telemetry and Satellite communications and control systems. The full-day objective of the class provides insight into various major components of a Tracking system. The course starts out with a “Microwave 101” overview of various antennas and propagation, then specific relevance to how tracking RF feeds and optics operate. The course then progresses on to the design of positioners, controllers, servo control loops and, finally, how a tracking receiver is utilized to control the entire system. This course does not cover receiver design or modulation techniques.

FUNDAMENTALS OF MICROWAVES AND RF

Instructor: Mr. Mark McWhorter, Lumistar, Inc.

The course begins with a brief review of the history of Microwaves, an overview of the microwave spectrum, basic physics of microwave propagation and reflection theory, standing waves, power density, phase and polarity. The second section of the course discusses various microwave component design and their applications. Consideration of antennas, transmission lines, couplers/splitters, hybrids, RF amplifiers, VCOs, isolators, attenuators, modulators, etc is given. The use of the Smith Chart and microwave test instrumentation is briefly discussed. The final section of the course discusses the general design and application of a complete digital TLM transceiving system, from airborne component to ground station including trade-offs impacting performance such as bit error performance, noise and consideration of multipath fading effects.

ONBOARD SOLID STATE RECORDING STANDARD

Instructors: Al Berard, Eglin Air Force Base and Mark Buckley, JDA Systems

Offers an in-depth tutorial presentation of the new IRIG 106-09 Chapter 10 standard for airborne flight test recorders, with recording and playback systems available for students to use and operate. The workshop leaders wrote the standard and played key roles in its development.

PERFORMANCE BASED SENSORS

Instructors: Jon S. Wilson, Jon S. Wilson Consulting, LLC

This one-day tutorial is intended for engineers, program managers and technicians who want a better understanding of transducer characteristics and specifications. It is presented from the viewpoint of a user who also has experience marketing transducers, rather than from that of a manufacturer.

Participants will learn how to interpret transducer specifications, define necessary performance characteristics for specific applications, and how to select the best transducer for their applications.

TELEMETRIC NETWORKS

Instructors: Thomas Grace, NAVAIR; Myron Moodie, SwRI

This course introduces participants to telemetric inter-networks. Participants will gain an understanding of networking principles, applicable networking technologies, design issues associated with building networks that contain telemetric links, and end-to-end telemetric applications. Specifically, the iNET (integrated Network Enhanced Telemetry) standards will be introduced and the applicability of Telemetry Network Systems discussed.

BASICS OF AIRCRAFT INSTRUMENTATION

Instructors: Mike Golackson and Jim Alich , AFFTC/Edwards

An introduction to the full measurement chain, from sensor to graphic display. Course will cover modern airborne data acquisition, recording, RF telemetry, and data reduction/processing systems. Emphasis is on practical application of instrumentation devices, their operations, and best practices.

THEORY OF CONSTRAINTS PROJECT MANAGEMENT AND ITS APPLICATION

Instructors: Carl Dane and Joe Dale, AFFTC/Edwards

Theory of Constraints Project Management (TOC PM) is utilized by many government and industry organizations to manage Flight Test, Acquisition, and Aircraft Modification projects. Part one of this briefing will describe the systemic problems related to managing projects, and the TOC PM solution designed to overcome those problems; planning, scheduling, synchronizing, project visibility and control, and resource behaviors. Part 2 of the briefing will provide insight on how the TOC PM methodology is being used on aircraft modifications and will include discussions on the benefits and results.