

ITC 2007: Short Courses

Updated 8/12/2007

ALL SHORT COURSES WILL BE CONDUCTED ON MONDAY, OCTOBER 22, 2007 FROM 9AM TO 5PM

BASIC SYSTEMS ENGINEERING

Instructor: Mr. Hal 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 Labs

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. This course is designed for the more experienced user. It includes a discussion on technology covering the entire system - 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.

INTRODUCTION TO GPS

Instructor: Mr. Karl Horton, DRS Training and Control Systems

Provides a fundamental understanding of GPS/Navigation Message and insight into where GPS technology is headed. Includes a basic overview of inertial-guided GPS systems and differential GPS in real-time systems.

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 OF 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 TECHNIQUES

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, TECOM Industries, Inc.

Provides insight into various RF feeds and optics, positioners, the controller, and other elements of a telemetry tracking ground station.

FUNDAMENTALS OF MICROWAVES AND RF

Instructor: Mr. Mark McWhorter, Lumistar, Inc.

Takes the student through basic principles such as the microwave spectrum, wave propagation, transmission lines, standing waves, Smith charts, antennas, components, and subsystems. Also, discusses the design of a microwave system and trade parameters impacting performance.

ONBOARD SOLID STATE RECORDING STANDARD (IRIG 106-05 Chapter 10)

Instructors: Mr. Al Berard, Eglin Air Force Base and Mr. Mark Buckley, EMC

Offers an in-depth tutorial presentation of the new IRIG 106-05 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..

INTRO TO MULTIPLE INPUT-MULTIPLE OUTPUT (MIMO) COMMUNICATION SYSTEMS

Instructors: Dr. Kurt Kosbar IFT/UMR Telemetry Learning Center, University of Missouri - Rolla

Provides an introduction to basic MIMO concepts, techniques and performance analysis. Traditional diversity techniques are reviewed and compared to MIMO systems. Common MIMO channel models are reviewed and the performance of systems which use these models are described.

PERFORMANCE BASED SENSOR SELECTION

Instructors: Jon S. Wilson, The Dynamic Consultant, 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.

TELEMETRY NETWORKS

Instructors: Thomas Grace, Naval Air Systems Command; Myron Moodie, Southwest Research Institute; John Roach, Teletronics Technology Corporation

This course provides an introduction to telemetry networks. Participants will gain an understanding of telemetry network, network models, applicable network technology, design issues associated with telemetry networks, and end-to-end telemetry applications. Two models for computer communications networks (the Open Systems Interconnection (OSI) reference model and the Internet reference model) will be reviewed briefly and their applicability as models for telemetry

networks will be discussed. This will be followed by an overview of current networking technologies that show promise for use in telemetry networks. In addition, accepted techniques for designing overall networks in which portions of the network must operate in multiple, diverse physical environments and provide different levels of performance will be presented. Finally, issues in evolving current telemetry systems to use networking technology will be discussed.