The University of Tennessee Space Institute occupies a 365-acre wooded campus beside Woods Reservoir in a peaceful setting ideally suited for study and research. The main building complex, which has won several architectural awards for its design, houses classrooms, conference rooms, and administrative, faculty and graduate student offices. The complex also has a 662 seat auditorium, a research library, computer facilities, and twelve additional buildings dedicated primarily to laboratory work.
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Continuing Education

The rapid changes in technology make it essential for a university to provide opportunities for continuing engineering studies. The University of Tennessee Space Institute recognizes Continuing Education (CE) as an integral part of the academic programs of the University of Tennessee.

The CE Program is designed to be responsive to: engineers, scientists, and the skilled craftsman in industry and government. The courses have been carefully selected for content and current developments in the specified field. The majority of the courses are conducted by UT faculty and by the most qualified subject matter experts available in education, industry, government and the private sector.

Suggestions for additional courses are continually solicited. In-house tailored contract courses can be arranged by contacting Becky Stines, Director at (931) 393-7276 or bstines@utsi.edu.

Courses For Organizations

In addition to the professional development courses listed herein, the faculty and staff of the University of Tennessee Space Institute are offering admittance to audit semester classes in a short course format. Attendees can access on-line, at their convenience, with an access code supplied at short course registration. These classes are offered through Engineering Management, Industrial Engineering, Mechanical, Aerospace, and Biomedical Engineering Departments.

General Information

Visit our website at: www.utsi.edu

Enrollment

Individual announcements for each course are mailed electronically listing specifics as to schedule, topics, and lecturer information. You may enroll by mail, telephone, e-mail or fax. Telephone enrollment made by an official training office is considered a firm registration and the cancellation policy will apply. To enroll by mail, use the registration form included in each electronic brochure, or check our website for a generic registration form, or simply call our office at (931) 393-7276. You may fax your registration by dialing (931) 393-7485. UTSI reserves the right to limit class size to ensure optimum interaction among participants. Course costs and dates are subject to change without notice.

Casual dress is appropriate

Please notify us if you require special meals, wheelchair access or other accommodations.
Fees

All fees are payable in U.S. dollars. Payment may be made by check, money order, or credit card (however, if you use a credit card – MasterCard, Visa or Discover – you will be assessed a 2.75% processing fee for using a credit card).

Training taken to maintain or improve professional knowledge and skills may be tax-deductible. Consult your tax advisor.

Continuing Education Units

Continuing Education Units (CEUs) are nationally recognized standard units of measurement awarded for participation in approved continuing education. A certificate for the appropriate number of CEUs as determined by the University of Tennessee will be presented to each attendee at the close of course.

Substitute Speakers/Course Notes

UTSI reserves the right to substitute speakers in the event of unusual circumstances. UTSI does not sell course notes. You must attend a course in order to receive the course materials.

Cancellations/Refund Policy

Refunds of registration fees can be made if cancellation notice is received 10 working days prior to the beginning of a course. Cancellations made less than 10 working days prior to the course will be assessed 20% of the registration fee. Registration made within the 10 working days prior to the course are subject to the same cancellation policy. Substitutions may be made at any time.

UTSI reserves the right to cancel any course due to insufficient enrollment or circumstances beyond its control. Enrollees will be notified and a full refund will be made. 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 a course cancellation.

Confirmation

Each enrollee will be mailed a letter of confirmation prior to the course. A telephoned registration made by an individual (to reserve a space) will be confirmed with a letter as soon as either the fee is paid or official notification is received by UTSI from his/her company or organization. A list of area motels will be included if the course is to be held on campus, or pertinent travel information will be included if the course is to be held off-site.

Accommodations

Motels are located approximately 12 miles from UTSI. The list of motels included with the confirmation letter is offered as a convenience and does not represent an endorsement of any particular establishment. Lodging expense is the responsibility of the enrollee. When making a motel reservation be sure to mention that you are a guest of UTSI to receive a special rate. Military personnel and government
employees may stay at the Arnold Air Force Base Wingo Inn located approximately two miles from the Institute. The Office of Continuing Education will assist with VOQ reservations.

**UTSI General Information**

The University of Tennessee Space Institute offers a graduate education second to none in the areas of aeronautics and propulsion, computational mechanics, and laser applications. The Space Institute has evolved into a premier research center and an internationally recognized catalyst for the stimulation and growth of high-technology industry in Tennessee. Its graduates include award-winning scientists, leaders in the aerospace industry, and space pioneers.

The Space Institute offers only graduate programs, which encompass academic fields in engineering and applied science. Some major areas of research include: aerospace propulsion and aeronautics, aircraft design, flight test engineering, computational mechanics, engineering management, high temperature power plants, laser applications, laser assisted manufacturing, materials processing and superconducting materials. Nearly 300 students come from 28 states and 11 foreign countries to work closely with professors of national repute.

The mission of The University of Tennessee Space Institute is to serve the state of Tennessee and the nation as a resource for the professional development of engineers and scientists through graduate education, interdisciplinary research, and the transfer of technology, particularly as related to the space and aerospace sciences. The Institute is committed both to providing a high quality learning and research experience leading to Master of Science and Doctor of Philosophy degrees in selected areas of engineering and science, and to continuing professional education.

The University of Tennessee Space Institute occupies a 365-acre wooded campus beside Woods Reservoir in a peaceful setting ideally suited for study and research. The main building complex, which has won several architectural awards for its design, houses classrooms, conference rooms, and administrative, faculty and graduate student offices. The complex also has a 662 seat auditorium, a research library, computer facilities, and twelve additional buildings dedicated primarily to laboratory work.

The Andy Holt Industry/Student Center at the edge of the lake provides housing for some students and guests of the Institute as well as recreational facilities, and dining room. A nearby dock and boathouse provide access to the lake.

The Space Institute’s location in Middle Tennessee is the center of a triangle formed by Nashville, Chattanooga, and the NASA Marshall Space Flight Center at Huntsville, Alabama. Its central location provides city cultural, entertainment and shopping activities. The beauty of the setting and the mild, four-season climate provide an ideal environment for advanced study and creative research.
If the course includes an AEDC Tour

AEDC welcomes the opportunity to show the complex to tour groups. The tour consists of a video presentation, a tour of the complex’s major facilities and takes approximately two to three hours. Tours are offered Monday through Friday (by request) except holidays.

Tours are scheduled by reservation at least two weeks in advance. The following information will help you in scheduling a tour of the complex. Please be advised that military requirements could cancel your tour even once confirmed. A list of names is required in advance. Additional tour information, forms and photographs are located on the AEDC tour web page at www.arnold.af.mil/tours.asp.

What You Need to Know  You must submit a tour roster with the name and citizenship of each visitor, as well as a Hold Harmless Agreement including any bus drivers a Talent Release form must be submitted for children 17 and under. The roster must reach the AEDC Public Affairs Office at least five business days in advance of your group’s scheduled visit.

Anyone not listed on your group roster should not be brought to AEDC. They will not be allowed to tour and their presence will delay or cancel your tour.

Tour Content/Dress

Tours are conducted in an industrial area and involve walking, some on steel grating, and climbing stairs. Comfortable walking shoes should be worn. **DO NOT WEAR HIGH HEELS, OPEN-TOED SHOES OR SANDALS.** Anyone not wearing appropriate footwear will not be allowed to tour. Children eight years old or older are welcome to tour.

Special Provisions for Foreign Nationals

Foreign nationals from NATO, allied and friendly countries generally can tour AEDC. However, they must be identified on the roster, and they must bring photo identification with them. Rosters containing foreign nationals must be submitted along with a color copy of their passport **14 business days in advance** of the tour date. You should confirm that all foreign nationals on your list have been approved by AEDC PRIOR to touring.

Special Arrangements for Mobility Impaired  AEDC is a large industrial complex and most of the facilities we tour are not equipped for mobility-impaired persons. We can, however, on a case-by-case basis, arrange tours for the mobility impaired but arrangements must be made prior to touring.

Size of Tour Groups

A tour group should consist of at least 15 people and a maximum of 35. Larger groups are considered on a case-by-case basis. Tour groups must provide transportation while touring. A small shuttle or large bus is acceptable. Multiple cars or a caravan of vehicles are not allowed for touring.

**REMEMBER:** Use of cameras and video recorders is not permitted. Smoking is not allowed during tour.
Short Courses Catalog

AEROSPACE ENGINEERING COURSES

Fundamentals of Flight Test Engineering

Course Fee: $10,800
Course Description:

This two week short course teaches the Fundamentals of Flight Test Engineering in a comprehensive, exciting format that incorporates academic lecture, 7 in-flight laboratory sessions where the students fly as Flight Test Engineers, and 2 in-flight laboratory sessions where the students fly as Test Pilots in UTSI Aviation Systems research aircraft. Academics and Flight Test Techniques for Performance and Flying Qualities flight testing will be covered. After taking this course, the student will be well grounded in the fundamentals required for performing the duties of a Flight Test Engineer, including aircraft familiarization, airmanship, test planning, and test reporting.

An optional capstone flight in a variable stability aircraft is available. The purpose of this flight is to demonstrate static and dynamic flying qualities representative of light aircraft, executive jets, and large transport aircraft. A major aspect of the in-flight simulator is that it represents a modern aircraft equipped with a fly-by-wire irreversible flight control system and an artificial feel system. A variable stability ground simulator is also included in the course.

Ground Based Low Earth Orbit Space Simulation

Course Fee: $1,795
Course Description:

This course is designed to assist engineers, physicists, and chemists who find that they need additional understanding of how to solve space simulation problems in ground-based facilities. It will emphasize techniques for simulating low earth orbit (100-1000 km).

While in low earth orbit a space vehicle is exposed to many influences. These include lift and drag due to neutral gas interactions, chemical reactions between rarefied gases and the materials on the surface of the satellite, contamination from gases that evolve from the spacecraft surface and from propulsion burns, and many radiation exposure effects. All of these influences will be discussed in this course and methods for their simulation in ground-based facilities described. This will include the design of space simulation chambers (specialized vacuum chambers) atomic oxygen generators, and UV sources. Methods for calibrating and using these simulators will be discussed. Where possible, comparison with space-based measurements will be made.

Human Engineering Principles for Flight Deck Evaluations
Course Fee: $1,995
Course Description:

The rapid advancement of technology has resulted in the accelerated proliferation of modern flight systems and associated crew station displays. These systems and displays are designed with the expectation that they will improve mission performance by increasing human-machine capability and efficiency. Historically, not all modern flight systems have met the goals of the designer, and in some cases, have resulted in poorer than expected system performance, increased human error, and additional safety of flight concerns. Many of these problems originate at the pilot-system interface because the design failed to properly consider important human sensory, perceptual, and cognitive characteristics affecting the attention of the pilot, situational awareness, decisions and actions. Further, if these characteristics are not properly considered in selecting and executing an appropriate test and evaluation methodology, erroneous or inconclusive findings could result with the potential for latent problems.

The first half of the course presents important human engineering principles relating to human sensing, perception, and cognition that directly affect human attention and performance and ultimately, human error and safety. The second half lectures focus on the process of human subject testing and evaluation. The lectures discuss application and considerations of human engineering principles, formulation of test design and data analysis, test execution, and case studies that provide practical applications of the entire process.

Introduction to Aerospace Vehicle Modeling and Simulation
Course Fee: $995
Course Description:

This course solving the equations of motion for a six degrees of freedom aerospace vehicle with numerical integration methods in MATLAB® / SIMULINK®, developing a physical understanding of equations of motion, aerodynamics, propulsion, and other subsystems in complex aerospace simulations. Wind tunnel and flight test data will be integrated into numerical simulations for batch processing and pilot in the loop simulations.

Students will be provided with a pilot in the loop simulation that integrates a joystick and is connected to FlightGear® visualization software on their personal computer. A joystick is required.

Introduction to Human Space Test
Course Fee: $1,795
Course Description:
This course will provide an introduction to some of the unique skills, training, and knowledge required to act as a crew member in a professional space test environment. Also, the course will include all academic lectures and pre-flight briefings and an enjoyable “flight day” where everyone will be actively involved with flight operations for the day associated with sub-orbital and orbital human space flight. The flight component allows each attendee to experience representative ‘g’ forces (launch) and the weightlessness of space.

Each of the following offerings is a 5-day session

**Course Fee Per Session: $3,500/person**

**Test Engineering Series**

**Test Engineer – Introduction to Test Engineering**

**Course Fee:** $3,500  
**Course Description:**

This one week short course incorporates academic lectures and 4 in-flight laboratory sessions where the students fly as test engineers in UTSI aviation systems research aircraft. Academics and test techniques for performance and aerodynamic flight testing will be covered. After taking this course, the student will be well grounded in the fundamentals required for performing the duties of a test engineer, test systems familiarization, data acquisition, and test execution on ground and flight test facilities. Class attendance is limited to 7 students.

**Test Engineer – Understanding Test Data**

**Course Fee:** $3,500  
**Course Description:**

This one week short course will provide an introduction to understanding test data in the time and frequency domain. Academics and practical laboratories will cover noise, biases, time alignment, uncertainty, and allow students to perform actual instrumentation calibrations (force, temperature, and pressure). Students will learn how to calculate measurement error bars and carry out end to end uncertainty propagation. Additional topics will include how to report data, what data to report, and how to automate the reporting process. The course includes 2 in-flight laboratory sessions where much of the data will be generated. Class attendance is limited to 7 students.

**Test Engineer – Test Data Displays**

**Course Fee:** $3,500
**Course Description:**

This one week short course will provide an introduction to the use and programming of test data displays. Academics and practical laboratories will cover data logging, time stamping, event programming, alerts, limits, and interacting with test data displays. Additional display topics will include human factors considerations such as understanding what makes a good data display and how to use displays to reduce test workload. The course includes 2 in-flight laboratory sessions where test data displays will be evaluated. Students will use existing LabVIEW (National Instruments) based displays and will be assisted in modifying test displays as required. Class attendance is limited to 7 students.

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**Test Engineer – Linking Ground and Flight Test Performance**

**Course Fee: $3,500**

**Course Description:**

This one week short course will provide an introduction to in-flight performance testing and its link to ground testing. Testing will be compared to similar testing on propulsion test stands and wind tunnels. This course incorporates academic lectures, two in-flight laboratory sessions where the students fly as test engineers in UTSI Aviation Systems research aircraft, and additional tests in UTSI’s wind tunnel and propulsion research facility. Academics and test techniques for climb and cruise performance testing will be covered. After taking this course, the student will be better able to understand the link between in-flight and ground test facilities. Class attendance is limited to 7 students.

---

**Test Engineer – Test Hazards and Risk Assessment**

**Course Fee: $3,500**

**Course Description:**

This one week short course will provide an introduction to test hazards and risk assessments technique. Academics and practical laboratories will cover writing test hazards, conducting safety review board, and writing safety findings. The course also includes 2 in-flight laboratory sessions were students will apply the test hazard and risk assessment process. Additional topics will include test incident reporting and investigations. UTSI report formats and processes are similar to NASA Armstrong and Edwards AFB however customer formats and processes are encouraged. Class attendance is limited to 7 students.

---

**Test Engineer – Test Project Engineering**
Course Fee: $3,500
Course Description:

This one week short course will serve as the capstone course in the test engineer series. The course is designed such that students will pick a flight test that is representative of their company’s current wind tunnel or propulsion testing and develop test plans, test cards, data analysis methods, gather test data, test reporting and a technical review board. Additional topics will include thresholds, objectives, goals, success criteria and pre-test predictions. The course includes 2 in-flight laboratory sessions where the test project will be conducted. Customer report formats and processes are encouraged. Class attendance is limited to 7 students.

ELECTRICAL ENGINEERING COURSES

Introduction to Digital Signal Processing with Applications for Scientists and Engineers
Course Fee: $1,475
Course Description:

This course introduces the fundamentals of digital signal processing and is designed for engineers and scientists with little or no experience with the theory of digital signal processing or its practical applications. The course material will be developed through a combination of mathematical theory, computer programming, and numerical experiments. Only modest mathematical skills are used during the course (algebra, finite and infinite sums, and some calculus); however, the emphasis on practical applications of digital signal processing techniques allows the majority of the course to be assessable to the student without a mathematical background. The course material is generally applicable to all realizations and implementations of digital signal processing algorithms. However, for the purposes of the course, LabVIEW is used to present specific examples of digital signal processing and provide students with an interactive experience using digital signal processing. Each student will receive a National Instruments myDAQ kit which includes a student copy of LabVIEW and a myDAQ data acquisition system. The NI myDAQ has the ability to convert analog signals to digital signals and also generate analog signals useful for testing algorithms. Familiarity with LabVIEW is not required for the course as the needed capabilities are modest and will be taught during the course. The course begins with a description of analog signals and their conversion to digital signals. Discrete time signals and systems are introduced and the classification of the systems presented. The properties of linearity, time invariance, causality, and stability are described. Computer experiments conducted at this point of the course allow the student to develop skills in acquiring and analyzing digital signals for rudimentary properties (i.e. means, standard deviations, probability distribution functions, etc.). Difference equations are defined and a specific realization of a difference equation introduces the student to real time digital signal processing using the NI myDAQ hardware. Simple examples of difference equations, capable of extracting useful information from digital signals, are presented to develop the student's understanding of the topic. Spectral analysis of signals is presented by examining the Fourier transform conversion of time domain signals into frequency domain signals. The digital Fourier transform is introduced and its implementation discussed. Experiments with audio signals
give the student an appreciation of spectral analysis requirements, commonly encountered pitfalls, and their remedies.

The course continues by presenting techniques of digital filtering. Finite impulse response and infinite impulse response filters are defined and discussed. Commonly used digital filters (Butterworth, Chebyshev, Elliptic, Bessel, etc.) are described and techniques for the design of filters are described. The student will gain experience in the design of digital filters via class exercises involving the acquisition and manipulation of audio signals. Methods for the decimation and interpolation of digital signals are described. These topics are combined to produce techniques for sample rate conversion. Cross correlation techniques for determining time delay, source location, and pattern matching are taught via numerical experiments using synthetic and real signals. This course focuses on the techniques of digital signal processing that are universally relevant. Hardware implementations of digital signal processing are beyond the intended scope of the course and are not covered.

Digital Signal Processing Using MatLAB

Course Fee: $1,475
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®. Numerous exercises are provided during the course workable in The Student Edition of MATLAB®.

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® 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 word length effects and methods for the lossless and lossy compression and restoration of digital data.
INDUSTRIAL ENGINEERING/ENGINEERING MANAGEMENT COURSES

Introduction to Project Management

Course Fee: $595

Course Description:

This course explores the basic processes and tools required to manage technical projects. Covered material includes staffing and managing the project, developing project plans and schedule, pricing and estimating work, project control, risk management, and contracts and procurement. The tools and processes are covered in the context of actual projects, experience with both government and commercial contracting, and lessons learned.

Course Objectives:

• Provide an understanding of basic tools and processes used to manage technical projects.
• Understand how to use the tools in actual applications.
• Impart examples and experiences from a variety of real projects.
• Impart an understanding of project management as a profession.

Topics:

• Project Management Overview
• History and Concepts of Project Management
• Staffing the Project
• Managing the Project
• Planning
• Network Scheduling Techniques
• Pricing and Estimating
• Project Control
• Risk Management
• Contracts and Procurement
• Lessons Learned

Duration = 8 hours

Leadership Strategies for Technical Professionals

Course Fee: $595
Course Description:

This course presents leadership strategies, principles, styles and dynamics that must be understood by technical professionals engaged in the creation of products, processes, and services in technology-based organizations through:

• Better understanding of leadership styles and their impact on a technical organization;
• Better understanding of, and differentiation between, a leader and a manager;
• Better understanding of organizational culture and how it influences the workplace and leadership issues;
• Better understanding of the unique nature of women and leadership and military leadership.

Course Objectives:

• To introduce and discuss the concepts, theory, and traits of leadership as it is differentiated from management methods and principles for technology and engineering organizations.
• To identify and define the similarities and differences between leadership in military and non-military organizations, leadership by and of women, and servant leadership.
• To internalize these concepts and understand how they influence personal choices to develop an effective leadership style as a technology manager.

Topics:

• Introduction
• Managers and Leaders
• Leadership Traits
• Military Leadership
• Women and Leadership
• Servant leadership
• Corporate Cultures
• Lessons from the Real World

Duration = 16 hours

Problem Solving and Decision Making

Course Fee: $595

Course Description:
This course explores the tools used by successful managers for problem solving and decision making, including organizational skills, investigative skills, alternatives analysis, and ensuring success through understanding the context by which to make a decision. Areas to be covered include a survey of common tools used in decision making, how one knows they have a problem, understanding the basis for the problem, and why decisions fail.

**Course Objectives:**

- Provide an understanding of common tools used for problem solving and decision making.
- Understand how one knows they have a problem.
- Understand the basis for the problem.
- Provide a context for decision making.
- Understanding why decisions fail.
- Putting it all together to solve complex problems.

**Topics:**

- History of decision making
- Decision Making Tools
- Cause and Effect Matrix
- Systems Thinking
- Causal Loop Diagramming
- Failure Modes and Effects Analysis
- Framework for Decision Making
- Integrating Tools
- Why Decisions Fail

**Duration = 16 hours**

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**Risk Management**

**Course Fee: $595**

**Course Description:**

Overview of risk management based on ISO 31000:2009 standards with an emphasis on project risk management and risk management for government agencies. The course will include understanding risk management, case studies, and a working practical example.

**Course Objectives:**

- Provide a basic understanding of the principles of risk management
- Understand risk management from the customer’s point of view
- Understand risk management on government projects
- Understand how to tailor the risk management process based on a project’s size and complexity
Topics:
- Overview of risk management definition
- Risk management vocabulary
- Understanding customer requirements
- Risk management as a tool for baseline management and decision making
- Risk management for government projects
- Tailoring the risk management process
- Case studies in risk management
- Practical example/student exercise.

Duration = 16 hours

Strategic Planning

Course Fee: $595
Course Description:

This course presents an introduction to strategic planning. External and internal environmental scanning, developing objectives, measures, and initiatives to ensure the strategy is executed are discussed.

Course Objectives:
- To introduce the topic of strategic planning.
- Learn how to perform an environmental scan.
- Learn how to integrate strategies vertically and horizontally in the organization.
- Learn how to develop initiatives and measurements of success.

Topics:
- Introduction
- Environmental scanning
- Vertical and horizontal integration
- Managing for success
  - McKinsey 7S Framework
  - Resource allocation
  - Execution
  - Performance measurement

Duration = 16 hours

Technical Writing

Course Fee: $695
Course Description:
This course presents an introduction to technical planning with a focus on technical reports. Developing a problem statement, entering the discourse community, selecting a journal, and making a technical argument are presented.

**Course Objectives:**
- Learn how to develop a problem statement and technical argument.
- Learn how to research and enter the discourse community.
- Learn how to create a technical report.
- Learn how to present a technical argument.

**Topics:**
- Problem statement
- Abstract
- Selecting a publishing venue
- Creating a technical argument
- Knowing when to stop talking!

**Duration = 24 hours**

**MECHANICAL ENGINEERING COURSES**

**Aero-Propulsion Systems, Technology, Test and Evaluation**

**Course Fee: $1,949**

**Course Description:**

The Aero-Propulsion short course has been updated and presented since 1964. This unique course, designed to present an overview of aero-propulsion system performance, engine operability, engine technologies, and test and evaluation processes. Current and future air-breathing propulsion systems performance and technology status will be presented to engineers, scientists and managers engaged in research, development, maintenance and operation, and test and evaluation. Lecturers from academic, government and industrial organizations who are actively engaged in air-breathing propulsion technology will discuss the state-of-the-art and the trends in aero-propulsion.

Aero-Propulsion was developed with support and sponsorship of the American Institute of Aeronautics and Astronautics (AIAA) Air Breathing Propulsion Technical Committee (ABPTC), and the Tennessee Section of the AIAA.

**Aerospace Ground Test Facilities**
The course is primarily to provide information concerning the role of aerodynamic and propulsion and test facilities in aerospace systems testing and development. Throughout the course emphasis is placed upon the items which will assist those involved in the utilization of test facilities. The utilization of ground test facilities in aerospace systems development will be described by means of lectures and audio-visual presentations. Lectures at the Institute by authorities on various types of aerospace test facilities will be supplemented by detailed tours of appropriate facilities at the Arnold Engineering Development Center. Those who are or will be involved in the utilization of ground test facilities in development programs will find this course to be particular benefit. Lecturers selected from the UTSI faculty are complemented by lecturers from USAF – AEDC, and the contract operator at AEDC (Jacobs Technology, Inc.), other Air Force Labs, major NASA Research Centers, and aerospace industrial organizations.

**Combustion Instability**

**Course Fee: $1,695**

**Course Description:**

Despite intensive work spanning five decades, the problem of oscillatory behavior of high-energy propulsion systems and industrial burners is still an important engineering problem. New problems continue to threaten important propulsion development programs such as the NASA Constellation program with its heavy-lift ARES system based on the five segment version of the Shuttle SRB. Current mathematical and computational tools in widespread use have failed to yield reliable techniques for predicting and especially for controlling such problems. It is imperative that correct procedures be implemented, since combustion instability problems usually appear late in the development cycle resulting in large, unexpected expenditures and delays in schedule. They are too often the reason for propulsion system program cancellation. New research has resulted in sharpened physical understanding, better diagnostic techniques, and improved predictive computational algorithms. This course will present a detailed and balanced coverage of the theory of combustion instability and the means to implement it in the design process. Emphasis will be on new findings including the effects of vorticity and other flowfield interactions not incorporated in the classical theories and computational tools. These will be discussed in detail along with a full treatment of established viewpoints including effects of flow-turning, velocity coupling, and distributed combustion effects. New techniques will be introduced that greatly improve the modal analysis procedures needed in identifying acoustic mode shapes and frequencies in complex system configurations.

Vastly improved nonlinear analytical techniques now allow accurate determination of limit cycle amplitudes giving a much better indication of the threat of an instability to the motor system. New improvements also extend the mean flow Mach number range so that problems in supersonic combustion instability can be accommodated. The course also includes comprehensive treatment of vortex shedding, effects of nonlinear interactions, and new methods for controlling combustion instabilities. Applications in solid and liquid rockets, turbojet thrust augmentors, ramjets and scramjets are covered. A multitude of data sets from many research and development programs and from current encounters with combustion instability difficulties will be used as case studies. Emphasis is on avoiding instabilities in the design process of a new system and eliminating them in an effective manner if they appear in the development cycle. Attendees will receive a comprehensive literature package and text material covering all aspects of the
course. These will be distributed in DVD format. Tables of experimental data and other visual supportive material and viewgraphs will be included. Latest versions of predictive algorithms will be demonstrated.

A practical problem solving session will be held to enable the attendees to gain hands on experience in solving realistic combustion instability problems.

Fundamentals of Solid Propellant Rocket Motors
Course Fee: $1,895
Course Description:

This course is a concise coverage of the fundamental principles of solid rocket motor design and analysis. Attendees will acquire a comprehensive working knowledge of all features that are unique to the operation of a solid rocket motor including: propellant formulations and their characteristics, propellant mixing and casting, CFD simulations of the casting process, propellant burning rate laws, the ignition process, combustion effects, the casting process, detonation, combustion chamber flow, steady and unsteady flow effects, design of propellant grain geometry, simulation of the burning process, two-phase flow effects involving combustion of metallic additives, nozzle flow and nozzle design, heat conduction effects and material ablation.

A brief introduction of operational problems unique to solid rockets is also presented. The course emphasizes the correct choice and application of analytical and numerical tools in design and in solid rocket development problem solving. Many case studies and examples of successful problem solutions are presented.

Hybrid Rocket Propulsion
Course Fee: $1,995
Course Description:

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 Space Ship One. 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.

Modern Liquid Rocket Design
Course Fee: $1,195
Course Description:

This course will provide an in-depth examination of the design of modern liquid rockets, including the design of propellant feed systems and engine thrust chambers. The material will go beyond standard textbook information and show how modern tools and technologies can impact design decisions and lead to innovative solutions. Additionally, the course will discuss how a small team of engineers can produce sophisticated rocket systems. While the course will focus on medium to large propulsion systems suitable for launch vehicles and missiles, the approaches and technologies can be applied to smaller satellite propulsion systems.

LABVIEW, MATLAB, AND PYTHON COURSES

Introduction to LabVIEW
Course Fee: $849
Course Description:

LabVIEW is a general purpose program development system available for computers running Windows, Mac OS, Solaris and Linux operating systems. Primarily used in technical environments requiring data acquisition and instrument control, LabVIEW allows rapid development of high performance computer programs critical to the practicing engineer or scientist as well as general purpose programs. Program development time using LabVIEW is dramatically reduced with respect to conventional languages without significant loss in program throughput while increasing overall program functionality via the use of standard LabVIEW capabilities. This short course is intended for those persons with no experience with LabVIEW programming but who are actively engaged in research programs requiring data acquisition, reduction, and presentation. The goal of the course is to give each student the capability to use LabVIEW to create programs capable of high performance data acquisition. Throughout the short course, many useful programs illustrating LabVIEW programming constructs will be created by the student in reaching the course goal. Each student will have access to LabVIEW running on a Windows computer system however skills developed during the short course are applicable to other operating systems.

Intermediate LabVIEW
Course Fee: $849
Course Description:

LabVIEW Applications for Scientists and Engineers is a second course in LabVIEW programming which builds on the basics of LabVIEW programming taught in the UTSI short course, Introduction to LabVIEW for Scientists and Engineers. The material of the introductory course covered the fundamentals of data flow programming techniques, front panel creation, and block diagram construction culminating with the exploration of data acquisition techniques in LabVIEW. The content of LabVIEW Applications for Scientists and Engineers is designed to instruct the scientist or engineer in the various techniques of combining LabVIEW block diagram elements and standard library SubVIs to make useful programs. The course material is taught via a series of complete, functioning, and useful programs constructed in LabVIEW’s G programming language. Programs to be created include a spectrum analyzer, digital signal analyzer, file transfer server and client, lock-in amplifier and detector, networked data logger, and digital image analyzer. These programs are intended to develop the student’s skill in using LabVIEW by illuminating the distinctive character of dataflow programming, by familiarization with the broad array of LabVIEW SubVIs, and by providing examples of LabVIEW programs duplicating the function of standalone instruments.

Introduction to MatLAB
Course Fee: $849
Course Description:

MATLAB is a high-level language and interactive environment for numerical computation, visualization, and programming. Using MATLAB, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming language such as C/C++ or Java.

Introduction to Python
Course Fee: $495
Course Description:

In this 2-day course you will learn Python is a free, high-level programming language that focuses on simplicity, readability, and doing a lot in a very little code. This course will offer an introduction to object-oriented programming with Python and using it to solve problems and automate various tasks. This course will be followed by a second (more advanced) course that will focus on applying Python for numerical/scientific computing applications and data visualization.

We will begin by introduction into how to interact with Python via the interpreter and how to run external programs via the command-line. We will discuss the basic data types, including strings, Booleans, NoneTypes, lists, tuples, and dictionaries. Then we will cover control structures including functions, logical conditions, and loops.

Much of this course will be spend introducing object-oriented programming in Python. This will involve introducing class structures, attributes and methods for classes, operation overloading, polymorphism, and inheritance. These object-oriented concepts are extendable to other programming languages as well, but we will focus on their usage in the Python programming language. Using these
concepts, we will introduce modules, file reading and writing, operating-system-level interaction, image manipulation, and writing graphical user applications.

The course will aim to equip participants with a working and extendable knowledge base in Python programming through the creation of mini-projects, which will facilitate practice in programming and applying Python codes for various problems and tasks.

**Numerical and Scientific Computing with Python**

**Course Fee:** $495

**Course Description:**

In this 2-day course your will learn Python is a free, high-level programming language that focuses on simplicity, readability, and doing a lot in a very little code. This course will focus on application of the Python programming language for numerical and scientific computing, as well as data visualization. A basic familiarity with Python programming and object-oriented concepts is assumed.

The primary focus will cover various numerical and scientific computing tasks using the Python environment. We will start by introducing basic array, vector and matrix operations using the NumPy and SciPy libraries. These libraries provide a useful and free MatLab-like environment in Python through which many important methods of numerical and scientific computing may be quickly applied to solve problems. We will focus on using Python to perform quick but useful calculations, such as matrix inversions, solving linear systems of equations, solving differential equations, numerical integration and approximation, data analysis, and data interpolation.

The secondary focus of this course will be geared towards data visualization using the free Matplotlib package. The use of NumPy and SciPy will provide lots of example data for us to practice rendering scatter, line, contour, filled-contour and 3D graphic plots to usefully present data to others. Rendering and interpolating data from unstructured meshes and automation to produce figure graphics in common image formats will be covered as well.

This course will ultimately aim to equip participants with a working knowledge of how to apply Python’s most basic libraries to the typical collection of problems faced in numerical and scientific computing, and how to usefully visualize and present the data that results from such calculations.

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**The Following 40 hour duration courses are available pre-recorded on-line only. To access the course, register and an access code will be designated solely to the registrant. The course may be accessed for a given time-frame, no downloading is permitted. If a retention evaluation is requested by your organization upon completion, UTSI will provide the evaluation, grade and respond to the designated representative of your organization.**

**AEROSPACE ENGINEERING**
Electric Propulsion

Course Fee: $695

Course Description:

Engineering concepts of electric propulsion and its application to modern satellites and deep space probes. Topics include physical principles, practical designs, and performance levels of electrically-powered space propulsion thrusters including: ion engines; pulsed and steady-state (fixed field) plasma and MHD thrusters including Hall Thrusters, and others. Recommended Background: Rocket propulsion.

Registration Permission: Consent of Instructor.

Duration = 40 hours

Special Topics in Aerospace Engineering: Space Environments Effects

Course Fee: $695

Course Description:

This is an introductory course on the effects of the space environment on space systems. The primary focus will be on the space environment in which satellites and spacecraft are in earth orbit. This environment contains many hazards, including: photons, particle radiation, meteoroids, high-energy atoms, molecules, and ions, extreme temperature ranges, and orbital debris. This course will be split into two parts: 1) the space environment and 2) the interactions of the space environment with spacecraft.

Duration = 40 hours
Advanced Topics in Project Management

Course Fee: $695

Course Description:

Advanced topics related to the management of engineering and technology based projects. Project Risk Management, Lean Concepts for Project Management, and Project Quality Assessment tools/applications as they apply to: Project proposal preparation; resource and cost estimating, project planning, organizing, controlling, execution, and termination. Discuss typical problems and alternative solutions.

Topics:
- Projects in Contemporary Organizations
- Strategic Management and Project Selection
- Managing Conflict and the Art of Negotiation
- Project Organizational Structure
- Project Activity and Risk Planning
- Budgeting and Estimating Cost and Risk
- Scheduling
- Resource Allocation
- Monitoring and Information Systems
- Project Control
- Project Auditing
- Project Termination
- Lean Concepts for Project Management
- AGILE Project Management Concepts

Duration = 40 hours
Analytical Methods for Engineering Managers

Course Fee: $695

Course Description:

Survey of management analysis and control systems through industrial engineering techniques. Qualitative and quantitative systems: methods analysis, work measurement, incentive systems, wage and salary development, production and inventory control, facility layout, linear programming and applied operations research techniques.

Topics:

Demand Forecasting
Probability and Statistics
Product, Process and Service Design; Reliability and Quality Management
Capacity Planning; Decision Planning/Learning Curves
Linear Programming
Scheduling

Duration = 40 hours

Design of Experiments

Course Fee: $695

Course Description:

Methodology for experiments in product, service and process improvements. Factorial experiments, screening designs, variance reduction and other selected topics for engineering managers. Taguchi philosophy and concepts. Optimization and response surface methods. Case studies.

Course Objective:

The course objective is to learn how to plan, design and conduct experiments efficiently and effectively, and analyze the resulting data to obtain objective conclusions. Both design and statistical analysis issues are discussed. Opportunities to use the principles taught in the course arise in all phases of engineering work, including new product design and development, process development, and manufacturing process improvement. Applications from various fields of engineering (including chemical, mechanical, electrical, materials science, industrial, etc.) will be illustrated throughout the course.
Topics:
Review of basic statistical concepts
Introduction to the analysis of variance (ANOVA)
Practical aspects of planning experiments
ANOVA; multiple comparisons, residuals and model adequacy checking
ANOVA; checking model assumptions, the Box-Cox method
Sample size in designed experiments, dispersion versus location effects
The randomized complete block design (RCBD)
RCBDs, Latin squares, etc.
Factorial designs
$2^k$ factorial designs
Blocking and confounding in two level factorial designs
$2^{k-p}$ fractional factorial designs
Response surface methods and designs
Random factors in experiments
Random factors in factorial experiments, mixed models
Nested designs
Split-plot designs

Duration = 40 hours

Financial Management for Engineering Managers

Course Fee: $695

Course Description:

Financial and managerial accounting in engineering and technology management. Transaction recording, financial statements, ratios and analysis, activity-based accounting, and standard practices for costing, budgeting, assessment, and control.

Course Objective:

The educational objectives of this course are to present engineering graduate students with a general overview of financial accounting from a business management perspective. Upon completion of this course, students will have obtained the basic knowledge in the financial mechanisms.

Topics:
Introduction to Managerial Accounting
Cost Behavior and Cost-Volume Relationships
Measurement of Cost Behavior
Basic Accounting: Concepts, Techniques, and Conventions
Introduction to Probability and Statistics

Course Fee: $695

Course Description:

Descriptive statistics, probability theory, discrete and continuous distributions, point and interval estimates, sampling distributions, one and two parameter hypothesis testing, simple linear regression, and linear correlation. Upon completion, students will demonstrate an ability to: (1) Apply knowledge of math, science, and engineering. (2) Design and conduct experiments as well as analyze and interpret data. (3) Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Objective:

Upon completion, students will demonstrate an ability to: (1) Apply knowledge of math, science, and engineering. (2) Design and conduct experiments as well as analyze and interpret data. (3) Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Topics:

• Probability Theory – Probabilities & Events
• Random Variables
• Distributions
• Descriptive Statistics – Experimentation & Hypothesis testing
• Estimation & Sampling
• Confidence Intervals
• Hypothesis Testing
• Inferences on Population
• Goodness of Fit Test
• Simple Linear Regression
• Correlation Analysis

Duration = 40 hours

Legal and Ethical Aspects of Engineering Management

Course Fee: $695

Course Description:

Legal aspects imposed by government and ethical considerations in engineering practice. This course explains the importance and rationale of ethical decision making in an engineering business environment as well as the skills and analysis necessary to succeed in professional careers. Ethical standards such as competency, integrity, objectivity, confidentiality, professionalism, and social responsibility will be addressed from a valued oriented business approach to provide a better understanding of legal implications. Course content includes selected readings, lecture, discussion, and student presentations. Current topics come from government laws and industry practices.

Course Objectives:

Legal aspects imposed by government and ethical considerations in engineering practice. Selected readings, lecture, discussion and student presentations. Current topics from government and industry.

Topics:
Importance of Business Ethics
Stakeholder Relationships
Social Responsibility
Corporate Governance
Emerging Business Ethics
Institutionalization of Business Ethics
Ethical Decision Making
Individual Factors
Moral Philosophies
The Role of Ethical Culture and Relationships
Insider Trading
Developing an Effective Ethics Program
Managing and Controlling Ethics Programs
Globalization of Ethical Decision Making
Case Studies

Duration = 40 hours
Managing Change and Improvement in Technical Organizations

Course Fee: $695

Course Description:

Course Objectives:
Obtain the ability to identify an organization and conduct an analysis of its change management philosophy and successes/failures of significant changes in its history.

Topics:
- Introduction to Course and Organizational Behavior
- Contexts
- Cognitive Processes
- Motivation
- Psychological Capital
- Communication
- Politics and Groups
- Performance Management
- Leadership
- Great Leaders
- Handling Change

Duration = 40 hours
New Venture Formation

Course Fee: $695

Course Description:

This is a three credit graduate engineering management course that covers the critical issues faced by technical managers and engineers in dealing with the crucial aspects of complex issues involved in new venture formation. The course will stress both a sound theoretical foundation as well as the practical applications. The course will cover organizational and financial planning and evaluation along with cost and location studies and market analysis to determine commercial feasibility of new technology based ventures.

Course Objectives:

The educational objectives of this course are to present engineering and technology management students with the major concepts and techniques involved in new venture formation in a technology based environment. This course is designed to prepare students to analyze and evaluate the critical issues involved in the design and management of technological based new venture formations.

Topics:

- Venture Opportunity, Concept, and Strategy
- Venture Formation Planning
- Detailed Functional Planning for the Venture
- Financing and Building the Venture
- Other topics as they are appropriate

Duration = 40 hours

Productivity and Quality Engineering

Course Fee: $695

Course Description:

Productivity and quality measures defined and used to analyze current competitive position of important sectors of American industry with respect to national and international competition. Study of management theorists and systems which promote or inhibit productivity or quality improvements.

Course Objectives:

The educational objectives of this course are to present engineering and technology management students with the major concepts and techniques involved in decision making and technology management. This course is designed to prepare students to think and evaluate the critical issues involved in the decisions made in the management of technological endeavors.
Additional objectives for this course will be to increase: (1) knowledge of contemporary issues, (2) an ability to communicate effectively and (3) an understanding of professional and ethical responsibility. In order to achieve these objectives, the course lectures and reading materials will incorporate material addressing contemporary issues that engineering managers must face when making decisions as well as the ethical and professional responsibilities that go with making those decisions. Case study examples will also be presented to provide a structured approach to analyzing these problems.

**Topics:**
- Scientific Management
- The Modern Workplace
- Decision Theory
- Organizational Culture
- Communications
- Systems and Profound Knowledge
- Leadership and Management
- Process Thinking
- Decision Making

**Duration = 40 hours**

**Strategic Management in Technical Organizations**

**Course Fee:** $695

**Course Description:**
Strategic planning process and strategic management in practice; corporate vision and mission; product, market, organizational, and financial strategies; external factors; commercialization of new technologies; and competition and beyond.

**Course Objectives:**
After successful completion of this course, you will be able to:
1. Outline and apply the strategic management process;
2. Analyze industry structure to understand industry performance differentials;
3. Assess a firm’s resources and capabilities and their potential to create competitive advantage;
4. Formulate strategies across the functional, business, and corporate level;
5. Formulate strategies in technological dynamic environments;
6. Determine key strategies for competing in a global world;
7. Create organizational change and implement strategies;
8. Conduct a comprehensive strategic management analysis;
9. Become an effective strategic leader;
10. Write a scholarly paper; and
11. Learn how to present conclusions and recommendations to technical managers.
Topics:

- **Strategy Analysis**
  - What is strategy and why is it important?
  - The Strategic Management Process
  - External Analysis: Industry Structure, Competitive Forces, and Strategic Groups
  - Internal Analysis: Resources, Capabilities, and Activities

- **Strategy Formulation**
  - Business Strategy: Differentiation, Cost Leadership, and Integration
  - Business Strategy: Innovation and Strategic Entrepreneurship
  - Corporate Strategy: Vertical Integration and Diversification
  - Corporate Strategy: Acquisitions, Alliances, and Networks
  - Global Strategy: Competing Around the World

- **Strategy Implementation**
  - Organizational Design: Structure, Culture, and Control
  - Corporate Governance, Business Ethics, and Strategic Leadership

- **Supplemental Information**
  - How to conduct a case analysis
  - Writing a scholarly paper
  - Making presentations to managers and customers
  - Performance evaluation of peers

**Duration** = 40 hours

**Theory and Practice of Engineering Management**

**Course Fee:** $695

**Course Description:**

This engineering management course that covers the critical issues faced by technical managers and engineers in dealing with the crucial aspects of complex issues involved in technical management ventures. The course will stress both a sound theoretical foundation as well as the practical applications. The following issues will be addressed: management of change, current influences, research and developments in workplace design, professional interrelationships of engineers and technical managers in their work environment, contemporary production and service organization issues in technical management, and the financial and legal environment faced by technical managers. The objectives of this course are to provide; working knowledge of current work environment issues faced by engineers as technical managers, an awareness of the current trends involved in the research and development of technology management.

**Course Objectives:**

The educational objectives of this course are to present engineering and technology management students with the major concepts and techniques involved in advanced work performance and technology management in
the engineering management environment. This course is designed to prepare students to analyze and evaluate the critical issues involved in the design and management of technological endeavors and organizational change.

**Topics:**

- Paradigms: Paradigm Shifts and Effects
- Nominal Group Technique
- Theory X & Y
- Organizational Improvements
- Teamwork
- Leading the Future
- General System Theory
- Systems Thinking

**Duration = 40 hours**
Course Instructors

Dr. Bruce Bomar - holds B.S., M.S., and Ph.D. degrees in Electrical Engineering. From 1973 until 1981 he was a Research Engineer at Arnold Air Force Base, Tennessee. Since 1981 he has been with the University of Tennessee in Knoxville and at the Space Institute campus in Tullahoma where his positions have included Professor of Electrical Engineering, Program Chairman in Electrical Engineering, and Dean for Academic Affairs. He is a past recipient of the UT Vice President's Award for Teaching Excellence, the UT Vice President's Award for Technology Transfer, and the Arnold Engineering Development Center Technical Achievement Award. He is a Senior Member of the IEEE and served as General Chairman of the 2009 IEEE Southeastern Symposium on System Theory. He has also served as Track Editor in Signal Processing for the *IEEE Transactions on Industrial Electronics*. His areas of expertise include digital signal processing, digital systems design, and instrumentation and sensors. He has taught many graduate courses and short courses on these subjects, most recently Digital Signal Processing for Instrumentation and Data Analysis at Edwards AFB in December 2014. He has published numerous refereed journal papers on the design and realization of digital filters.

Dr. Roger Crawford - Professor Emeritus of Aerospace Engineering at UTSI, has 40 years of research and development experience in fluid mechanics, high temperature gas dynamics and propulsion. He served as director of propulsion test at AEDC and conducted research on axial flow compressors and rocket engine turbopumps. He is an Associate Fellow of AIAA.

Dr. Gary Flandro - is Professor Emeritus of UTSI in Mechanical Engineering. He has devoted over four decades to the study of oscillatory flow phenomena. He received his Ph.D. from Caltech. His research interests include acoustics, aerodynamics, rocket propulsion, flight mechanics and performance, hypersonic aerodynamics, propulsion, and vehicle design. He is the discoverer of the multi-planet "Grand Tour" mission opportunity that utilized gravity assist of the space craft (ultimately the Voyager) to explore the four major outer planets of the solar system.

Research projects include application of computational fluid dynamics methods in solid rocket motor design, nonlinear combustion instability, effects of vorticity transport in unsteady rocket flows, effects of hypersonic vehicle flight attitude on scramjet thrust vector, flow-driven pressure oscillations in large segmented rockets, and dynamics of slag motion in spinning combustion chambers.

Planned research includes: application of hybrid low-thrust systems for manned interplanetary space flight, development of efficient, low-cost hybrid rocket motor thrust chambers, flame zone physicochemistry in solid rocket instability, predictive algorithm for nonlinear rocket instability, and effects of vehicle flexibility on hypersonic vehicle integrated propulsion system performance.

Dr. Borja Martos - is currently a Research Engineer and Test Pilot at Embry-Riddle Aeronautical University (ERAU). He holds a B.S. and a M.S. in Aerospace Engineering from ERAU, and a Ph.D. in Aerospace Engineering from UTSI. He has over ten years of experience as a flight test engineer and over seven years of experience in directing and teaching academic courses and short courses in aircraft performance, flying, and handling qualities. As a flight test/instrumentation engineer for Eagle Works, he was responsible for developing data acquisition system and analysis methods for
several flight test programs using MATLAB/SIMULINK and LABVIEW. This included single engine and multi-engine fixed-wing and rotary wing aircraft. At UTSI he supported performance, flying qualities, and handling qualities research as a flight test engineer and as a research pilot. He is an expert in fly-by-wire in-flight simulator aircraft, active/passive feel systems, and aircraft modeling and simulation. Dr. Martos has an FAA airline transport pilot rating with instrument and multi-engine instructor ratings. He has over 2000 hours of pilot time and over 500 hours in research aircraft as a flight test engineer.

**Dr. Trevor Moeller** - is an Associate Professor in the Mechanical, Aerospace and Biomedical Engineering Department at the University of Tennessee Space Institute. He received his Ph.D. in Mechanical Engineering from the University of Tennessee in 1998, MS in Mechanical Engineering from UT in 1993, and a BS in Mechanical Engineering from Rose-Hulman Institute of Technology in 1991. Dr. Moeller specializes in high temperature gases and plasmas and air plasmas and high-speed flows, having experience in both modeling and experimentation. Since joining UTSI, Dr. Moeller has been the principal investigator of programs with funding of more than $4M, including electric propulsion thruster and rocket programs requiring detailed plasma diagnostics and plasma simulations. He has also served as principal investigator of programs to develop/model probes for high-enthalpy flows. He has more than 42 papers in journals and conference proceedings and has received one patent. He is a reviewer for NSF and many international journals. Dr. Moeller has served on the Executive Committee of the IEEE Nuclear and Plasma Science Society (2005-2008) and is a current member of the AIAA Plasmadynamics and Lasers Technical Committee (2007-present).

**Mr. Richard Ranaudo** - earned a B.S. in Civil Engineering from the University of Connecticut (1967) and a M.S. in Aeronautical and Astronautical Engineering from Ohio State University (1978). He has been a professional aviator and test pilot for over 40 years, accumulating over 12,500 flight hours in high performance fighter, transport, and research and development aircraft. Mr. Ranaudo began his flying career as an Air Force fighter pilot. Upon leaving active duty, he was hired by NASA (1973) and served in that capacity for 25 years, eventually becoming the Chief of Flight Operations at the Glenn Research Center, Cleveland, Ohio. While at Glenn, Mr. Ranaudo performed flight investigations for advanced subsonic and supersonic propulsion systems, icing effects on aircraft handling and performance, microgravity science and astronaut training, and for USAF sponsored 3-D Audio and Voice Recognition research. He was also instrumental in developing simulator systems to test and evaluate advanced propulsion and integrated controls concepts at Glenn. In 1998, Mr. Ranaudo joined Bombardier Aerospace as the Manager, Canadair Flight Test Programs. There, he was responsible for flight testing and systems evaluations that supported the development, and certification of the Global Express Intercontinental Business Jet and the CRJ 700 and 900 Regional Jet aircraft. After retiring from Bombardier, Mr. Ranaudo joined the University of Tennessee Space Institute (2002) where he developed and taught four graduate level courses including two courses in human factors. He was also the principal investigator for NASA and USAF sponsored research programs and advisor to students who wrote theses on human factors topics, some of which became technical publications. Mr. Ranaudo developed the highly popular UTSI aircraft icing short course, which has been attended by over 200 civil, military and government flight test and certification personnel worldwide. Mr. Ranaudo has authored 28 technical papers. His most recent paper, Piloted Simulation to Evaluate the Utility of a Real Time Envelope Protection System for Mitigating In-Flight Icing Hazards, AIAA 2010-7986 will be used as the basis for one of the case studies presented in this short course. Mr. Ranaudo retired from UTSI in January, 2010, and remains a consultant to the University for Sponsored Research and the Continuing Education Program.
Dr. James Simonton - Dr. Simonton is currently an Associate Professor of Industrial and Systems Engineering at the University of Tennessee. In his current position he acts as the program coordinator for the Engineering Management Program as well as the Director of Distance Education at the University of Tennessee Space Institute. His research interests include project management, systems engineering, operational research, engineering economics, statistical analysis, logistics, lean six-sigma, and quality. His research continues to be involved in alternative energy research in the areas of electrical generation, biomass gas to liquids, and utilization of stranded or flared natural gases.

Dr. Janice Tolk - is a retired Assistant Professor with the University of Tennessee Space Institute in the Industrial and Systems Engineering Department. She was previously employed by Babcock & Wilcox Technical Services Pantex, LLC at the Pantex Plant in Amarillo, Texas where she has served in a variety of management and leadership positions and in multiple organizations, thus gaining a wide range of experience in facility engineering and construction; project management; risk management; maintenance management; safeguards and security; high explosives manufacturing, research and development; and special nuclear materials development and testing. She helped develop the project plan for High Reliability Organization principles for the Pantex Plant, and led the implementation in the Explosives Technology Division. She was also the project manager for startup of the Special Nuclear Material Component Requalification Facility; a capstone of over 20 years of project management experience. Upon retirement, she entered academia where she taught graduate courses in Industrial Engineering and Engineering Management topics at Texas Tech University and the University of Tennessee Space Institute. She holds a Bachelors of Civil Engineering Degree from the University of Kentucky, a Masters of Engineering from Texas Tech University, and a Ph.D. in Systems and Engineering Management from Texas Tech University. Her research interests include High Reliability Organization (HRO) theory and practice; deferred maintenance management; performance measurement and management; strategic management; and productivity and performance improvement.

Dr. Brad Winkleman – has been developing advanced diagnostics for combustion systems since receiving his doctorate in physics from the University of Tennessee in 1992. He currently is a senior scientist responsible for implementing state of the art augmentor measurement systems at the Arnold Engineering and Development Complex in Tullahoma, Tennessee. He has employed National Instrument’s LabVIEW in his research since 1986 with its introduction for Apple Macintosh computers and later adding other operating systems to his repertoire as introduced by National Instruments. He has been teaching a broad spectrum of LabVIEW and digital signal processing courses for nearly 20 years. The courses cover fundamental concepts of dataflow programming through advanced techniques required for high performance data acquisition and methods for analyzing data in both time and frequency domains.

Additional instructors will be added to the roster to assure the most current subject matter experts are provided. Course costs and dates are subject to change without notice.
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