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CALENDAR --- 2008 SPRING SEMESTER

Priority Registration.....	October 15, 2007 – January 2, 2008
Admission to Candidacy Forms for Spring 2008 Commencement	December 4, 2007
Spring 2008 Graduation Application Deadline	December 4, 2007
University Closed, but CPO.UTK.EDU is available	December 24-28, 2007 & January 1, 2008
Late Registration and late fees begin	January 3 - 18, 2008
Classes begin.....	January 9, 2008
Martin Luther King Holiday	January 21, 2008
Last Day to Late Register, Add, Change Grading Options or Drop Without a “W”	January 18, 2008
Last day to add/change credit with signatures	January 19, 2008
Graduation Fee Payment Deadline (MS \$30, PhD \$75)	March 7, 2008
Preliminary Thesis/Dissertation Review Deadline	March 7, 2008
Spring Break (No Classes).....	March 14 & 17-20, 2008
Spring Recess (No Classes)	March 21, 2008
Purchase cap and gown and order hood.....	March 13, 2008
Register to attend the Graduate Hooding Ceremony (http://gradschool.utk.edu)	March 13, 2008
Last day to schedule final exam (thesis)	March 13, 2008
Last day to schedule final exam (non-thesis/capstone students).....	March 13, 2008
Last day to schedule final exam (dissertation).....	March 28, 2008
Drop with a “W”	April 1, 2008
Last day to take final exam (thesis/dissertation students).....	April 4, 2008
Last day to take final exam (non-thesis/capstone students).....	April 4, 2008
Electronic Thesis/Dissertation due in Knoxville (5:00 P.M. EST).....	April 18, 2008
Submit report of final examination (Pass/Fail) form	April 18, 2008
Deadline for Submission of Admission to Candidacy for students Graduating Summer 2008 and Graduation Application.....	April 25, 2008
Deadline for removing "INCOMPLETE" grades	April 25, 2008
Classes End	April 25, 2008
Total Withdraw from the University Deadline	April 25, 2008
Study Period.....	April 28, 2008
Exam Period.....	April 29, 30, May 1, 2008
Graduate Hooding Ceremony (UTK)	May 8, 2008
COMMENCEMENT (UTK)	May 9, 2008
Second thesis/dissertation deadline (Student will receive diploma August 2008 but do not have to register for Summer 2007) (Defense Completed by April 25)..	May 23, 2008

SUMMER SEMESTER 2008

Priority Registration for Summer Semester 2008 UTSI begins.....	TBD
Final Registration for UTSI students	TBD
Memorial Day Holiday	May 26, 2008
Classes begin.....	June 2, 2008
July 4 th Holiday	July 4, 2008
Classes End	August 7, 2008
Summer Graduation Date on Transcript (No Ceremony).....	August 15, 2008

**SPRING SEMESTER 2008
FINAL STUDY DAY AND EXAM SCHEDULE**

LAST DAY OF CLASSES.....April 25, 2008

STUDY PERIODApril 28, 2008

FINAL EXAMS 2008

REGULAR CLASS TIME	(Same Classroom)	EXAM TIME
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1st Day - Tuesday, April 29, 2008

7:45 - 9:00	M/Th	7:45 - 9:45
10:45 - 12:00	M/Th	10:15 - 12:15
9:15 - 10:30	M/Th	1:00 - 3:00
2:30 - 3:45	M/Th	3:30 - 5:30

2nd Day – Wednesday, April 30, 2008

9:15 - 10:30	Tu/Fri	7:45 - 9:45
10:45 - 12:00	Tu/Fri	10:15 - 12:15
1:00 - 2:15	Tu/Fri	1:00 - 3:00
2:30 - 3:45	Tu/Fri	3:30 - 5:30

3rd Day - Thursday, May 1, 2008

7:45 - 9:00	Tu/Fri	7:45 - 9:45
1:00 - 2:15	M/Th	10:15 - 12:15

**** ATTENTION ****

ALL STUDENTS TAKING VIDEOTAPE COURSES
CONTACT INSTRUCTOR FOR DATE AND TIME OF FINAL EXAM

NO CLASSES WILL BE IN SESSION
AT THIS TIME

**REGISTRATION ANNOUNCEMENT
SPRING SEMESTER 2008**

REGISTRATION PROCEDURE

ADVISING

Graduate students should contact their departmental faculty to arrange an advising appointment. The web registration system will ask if you have discussed your program with your advisor. Answer "yes" if you have.

REGISTRATION

UTSI students **MUST** register for the 2008 Spring semester on the Web at Circle Park Online <https://cpo.utk.edu/CPOWeb/> . The registration system will be available Monday through Saturday, 6:00 AM - 11:00 PM (CST) and Sundays 12:00 PM - 5:00 PM (CST). Registration will be October 15, 2007 – January 2, 2008. Late registration will be January 3, 2008. Classes begin Thursday, January 9, 2008.

Plan your schedule. Here's a table to help with this process:

Department Number	Course Number	Section Number	Spec.Credit/ Grading	Credit Hours	Hours/Days	Place

Students log on to CPO using their Net ID and password. If you do not know your Net ID and Password, please visit the University Registrar's website at http://registrar.tennessee.edu/student_id.shtml . Scroll down the page to "What is a Net ID and Net ID password?" You will find helpful information about obtaining Net IDs and Net ID passwords.

CPO Technical Support: Send email including your return email address in the text of your message to cpo@utk.edu

Days of the Week

M-Monday T-Tuesday W-Wednesday R-Thursday F-Friday S-Saturday

Financial Calendar for Spring Term 2008

Last Registration Day for Receiving Statements by Mail	December 8, 2007
Statement Information Available on CPO	December 10, 2007
Priority Registration Payment/Confirmation Deadline	January 2, 2008 (3:30 pm CST)
Late Registration/Late Fees Begin	January 3, 2008
Late Payment and Confirmation Deadline	January 18, 2008 (3:30 pm CST)

CREDIT CARD PAYMENTS

**** NOTE:** If you pay your fees using Circle Park Online (CPO) using a credit/debit card (Discover, VISA, Mastercard) you will be assessed a 2.5% service fee. To avoid this service fee you will need to make payment to the UTSI Business Office.

SPECIAL BILLING – THIRD PARTY BILLING:

The Business Office will generate a billing after the student has provided a letter of authorization from the third party sponsor. Authorization must include the sponsor's name and address as well as the maximum amount which will be paid for each specific term. The authorization can be mailed to UTSI Business Office, MS#12, 411 B.H. Goethert Parkway, Tullahoma, TN 37388-9700 or email it to jboyles@utsi.edu. Since students are responsible for all University fees and charges, use of the third-party address as the student's billing address is strongly discouraged.

STUDENTS ARE ULTIMATELY RESPONSIBLE FOR ALL CHARGES. THEY MUST COMPLETE A CONFIRMATION OF ATTENDANCE FORM AND MAKE CERTAIN MINIMUM PAYMENT AMOUNTS CREDITED OR AUTHORIZED ON OR BEFORE THE PAYMENT DUE DATE IN ORDER TO AVOID LATE PAYMENT FEE ASSESSMENT AND SCHEDULE CANCELLATION.

If you have any questions concerning third-party billing please call Jennifer Boyles at 931-393-7297 or 888-822-8874 ext 297 or by email jboyles@utsi.edu

TOLL-FREE NUMBERS

For a specific office:	1-888-822-UTSI (8874) and the extension number.
For general information:	1-888-822-UTSI (8874)
Admissions Office:	1-888-822-UTSI (8874)-432
Bookstore:	1-888-822-UTSI (8874)-204
Business Office:	1-888-822-UTSI (8874)-204
Registrar's Office:	1-888-822-UTSI (8874)-228

BOOKSTORE HOURS

The Bookstore is located in Lower C-Wing. The Bookstore hours are 8:00 a.m. - 4:00 p.m. All textbooks will be returned to the publisher one week after midterm. For further information

concerning books contact the Bookstore, ext. 204 or 314 or by email Robin Nee at rnee@utsi.edu or Vicki Carr at vcarr@utsi.edu

APPLICATION FOR ADMISSION

No student will be allowed to register unless a completed Application for Admission to the Graduate School of the University of Tennessee, Knoxville (UTK) is on file in the Registrar's Office. An Application for Admission to the UTK Graduate School must be accompanied by a \$35.00 non-refundable application fee, payable to The University of Tennessee Space Institute. Applicants are required to provide one official transcript of all undergraduate and graduate records. Students may apply on-line at <http://admissions.utk.edu/graduate/apply.shtml> [click on APPLY ONLINE and Follow Directions]. Applications for Admission and Transcripts from part-time students should be sent to the Registrar's Office, A102, Mail Stop 7, UTSI, Tullahoma, TN 37388-9700. Full-time students send Application for Admission, transcripts, GRE scores (if required); and if international application, TOEFL scores to the Admissions Office, A104, Mail Stop 5, UTSI, Tullahoma, TN 37388-9700.

PAYMENT OF FEES

Payment of fees is due at time of registration. Late fees will begin on January 3, 2008. The only credit/debit cards The University of Tennessee Space Institute accepts are Visa, MasterCard and Discover.

FEES OF DISTANCE STUDENTS

Distance students should contact their departmental coordinator to determine the amount of the access fee.

Aviation Systems	Stephen Corda	931-393-7413	scorda@utsi.edu
Engineering Mgt.	Penny Morris	931-393-7293	pmorris@utsi.edu

TUITION AND/OR MAINTENANCE FEES*

Full Fees For In-State Students (per semester)

Maintenance Fee	\$2954.00*
Programs and Services Fee	90.00
Total	\$3044.00

Full Fees For Out-Of-State Students (per semester)*

Maintenance Fee	\$2954.00*
Programs and Services Fee	90.00
Tuition	\$5971.00*
Total	\$9015.00

***All fees are subject to changes approved by the Board of Trustees prior to the beginning of the term.**

TUITION FOR PART-TIME STUDENTS

Part time students may elect to pay fees computed by the semester hour credit as follows:

IN-STATE	\$329.00 per semester hour
3 hrs.	\$987.00
OUT-OF-STATE	\$993.00 per semester hour
3 hrs.	\$2979.00

PROGRAMS AND SERVICES FEE

All students enrolled in nine semester hours or more for Fall or Spring Semester are assessed an activity fee of \$90.00 per semester. Part-time students taking fewer than nine hours will be assessed at the rate of \$10.00 per semester hour. The Programs and Services Fee is non-refundable. Research Assistants and Fellowship/Scholarship Students who may have a waiver of fees (tuition), must pay appropriate University Programs and Services Fee.

Part-time students enrolled for videotape classes at off campus centers and students residing out of state are not required to pay the Programs and Services Fee.

RETURNED CHECK POLICY

All checks are deposited the day they are received. A \$30.00 service charge will be assessed when checks fail to clear the bank on which drawn. In addition, if the returned check is in payment of initial fees and charges, the late payment fee in effect at the time the check is redeemed will be added to the returned check service fee. Returned checks will not be re-deposited. Cash or a cashier's check is required for payment of a returned check, late fee, and service charges. Failure to clear returned checks will result in the forfeiture of all University services including the receipt of grades, transcripts, and schedules of classes.

DEFERRED PAYMENT PLAN

Although fees, rent and other University expenses are due and payable at the beginning of each term, a full-time student in good financial standing with a definite anticipated source of funds may request the deferment of up to 50% of the total charges at registration. The deferred payment must be paid by the 45th (February 26, 2008) day of the semester. All financial aid monies must be applied to fees before a deferment will be considered. A deferred payment service fee of \$20.00 is assessed when any portion of tuition, fees, and other charges are deferred with the approval of the Business Office. An additional \$35.00 late payment charge will be assessed if the second installment is not paid on or before the due date. For more details, contact the Business Office.

LATE PAYMENT FEES

A **Late Payment Fee** of \$35.00 will be added to each *VOLXpress* account if the minimum payment amount which is printed on the statement is not received by the Bursar's Office on or before the published due date. This does not include beginning of term registration statements which will result in cancellation of schedules if the minimum payment is not met. Late payment fees are exclusive of all other charges and are due when assessed whether or not the student receives a *VOLXpress* statement. Accounts are subject to a late fee of \$45.00 if there is

an account balance at mid-semester. The fee is assessed in addition to the unpaid fees and charges and the account balance must be paid in order to access registration services, receive a transcript, grades, or a diploma.

TUITION/FEES POLICY FOR DROPPED COURSES OR WITHDRAWAL

THE PERCENTAGE TUITION REFUNDS SPECIFIED ON THE FOLLOWING PAGE ARE APPLICABLE WHEN A STUDENT DROPS ONE OR MORE COURSES (INCLUDING TOTAL WITHDRAWAL). Students who drop courses and continue with a reduced course load are eligible for a refund only if the total charges at the semester hour rate for the courses continued plus the percentage assessed at the semester hour rate for the courses dropped results in an amount less than that paid. The Programs and Service Fee is non-refundable.

A COURSE IS NOT OFFICIALLY DROPPED UNTIL A CHANGE OF REGISTRATION FORM HAS BEEN PROCESSED BY THE REGISTRAR'S OFFICE. CANCELED COURSES OR FAILURE TO ATTEND CLASS DOES NOT AUTOMATICALLY WITHDRAW OR DROP A STUDENT FROM THE UNIVERSITY OR CLASS --- A CHANGE OF REGISTRATION FORM MUST BE COMPLETED.

The following percentage assessments are applicable for courses dropped (if fees are assessed at the semester hour rate):

DROP DATE	CHARGE	REFUND
January 9 - 13	NO CHARGE	100%
January 14 - 19	20% CHARGE	80%
January 20 - 24	40% CHARGE	60%
January 25 - 29	60% CHARGE	40%
January 30 - End of Term	100% CHARGE	NO REFUND

TUITION/FEE REFUND POLICY FOR WITHDRAWALS

Withdrawal from school for the term after registration has been processed, even though classes have not been attended or fees paid, must be by official notification to the Registrar's office. The effective date of withdrawal is the date the Registrar's office is notified by completion of the Change of Registration request form. FAILURE TO ATTEND CLASS DOES NOT AUTOMATICALLY CANCEL ENROLLMENT. The appropriate percentage of fees will be charged unless the Registrar's Office is notified by the close of the last day designated for registration and before the first official day of classes for the semester or term. WITHDRAWAL DOES NOT CANCEL FEES AND CHARGES ALREADY INCURRED. THE DROP/ADD PROCEDURE CAN NOT BE USED TO WITHDRAW FROM SCHOOL FOR THE SEMESTER OR TERM. When a course is canceled by UTSI administration, the students who have registered for the course will be notified by either the instructor and/or the Registrar's Office and required to file a Change of Registration form with the Registrar's Office, UTSI, Room A102, 393-7228.

The University of Tennessee Space Institute, in accordance with federal regulations, follows the policy and procedures below for calculating refunds and repayments for financial aid.

REFUNDS

Refunds are defined as the portion of maintenance and/or tuition and University housing charges due as rebate when a student withdraws or is expelled from the University. The amount of a refund is determined by the Drop Date Charge fee table on this page.

REPAYMENTS

Repayments are defined as that portion of aid, received by a student after the University direct charges have been paid by that aid, that must be repaid by a student when a student withdraws or is expelled. The amount of the repayment is determined by the Drop Date Charge fee table on the previous page.

Refunds and repayments to the Title IV programs are determined according to the formula published in the current Federal Student Financial Aid Handbook. The Business and Admissions Offices are responsible for determining the amount of the refund and/or repayment and distributing the correct amount back to the financial aid programs according to the Refund/Repayment Allocation Policy.

WITHDRAWAL (TOTAL) FROM THE UNIVERSITY

If, after registering for classes and either returning your fee payment or your Confirmation of Attendance form to the Bursar's Office, you decide not to enroll for this term, you must immediately notify the Registrar's Office at UTSI. If you withdraw officially on or before a Change of Registration deadline, but after the no "W" deadline for a particular session, the grade of "W" will be issued.

GRADES

Students may obtain their grades through the web at <https://cpo.utk.edu/CPOWeb/enterCPO.jsp> or by calling 865-656-2527. Grades will not be mailed unless a printed copy is requested through the web address. Students will be prompted to enter their ID number and their Personal Security Code. There is a limit of 8 telephone calls per student, per semester. Unlimited access is available via the Internet. Grades may also be obtained through the Registrar's Office at UTSI.

GRADUATE STUDENTS CHANGE OF REGISTRATION AFTER THE DEADLINE

To change registration in any way after the deadline, a graduate student must present a request, signed by the instructor(s) and adviser as evidence of their knowledge of the request to the Registrar's Office at UTSI. Graduate students must verify that ALL changes have been approved by their academic adviser. If the Office of Graduate Student Services approves the change of registration, the change will be noted on the student's permanent record. **THE DROP DEADLINE FOR GRADES AND THE DROP DEADLINE FOR FEE REFUNDS ARE NOT THE SAME.**

FULL-TIME STUDENTS

Students enrolled in at least 9 semester hours during the Fall/Spring semesters or 6 hours in the Summer Term are considered full-time students. Research Assistants must be full-time students and also enroll in one of the MABE 595 seminars or a PHYS 599 seminar each term, unless a waiver is granted by the Dean for Academic Affairs.

REMOVAL OF INCOMPLETE GRADES

All Incomplete Grades (I) must be removed within one semester, excluding the Summer Term. If a supplementary grade report has not been received in the Registrar's Office at the end of the following semester, the I will be changed to an F. The course will not be counted in the cumulative grade point average until a final grade is assigned. Students wishing to graduate Spring Semester 2008 must remove all INCOMPLETE GRADES by **April 25, 2008**.

It is the responsibility of the student to contact the instructor and the instructor's responsibility to complete a Grade Change form. The Registrar's Office cannot change a grade on verbal instructions only.

REPEATING A COURSE

No graduate student may repeat a course for the purpose of raising a grade already received, with the exception of a NC course. A graduate student cannot do additional work nor repeat an examination to raise a final grade.

ADMISSION TO CANDIDACY

MASTER OF SCIENCE DEGREE:

Each M.S. student, including IE Capstone Project students, is responsible for submitting to the Registrar's Office a completed and signed Application for Admission to Candidacy form at least one semester prior to receiving the degree.

Candidacy committee changes or course changes must be submitted to the Committee Chairman using a Change of Committee/Course for approval. This form is available in the UTSI Registrar's Office.

ADMISSION TO CANDIDACY

DOCTOR OF PHILOSOPHY DEGREE:

A Doctoral Committee should be formed during the student's first year of doctoral study and submitted to the Registrar's Office for approval. The form is available in the UTSI Registrar's Office. Any changes to the doctoral committee (deletions or additions) must be done through the Registrar's Office. Each Ph.D. student is responsible for submitting to the Registrar's Office a completed Admission to Candidacy form signed by the Doctoral Committee at least one semester prior to receiving the degree. The Candidacy form must be approved by the UTK Graduate School before a student will be admitted to candidacy. The comprehensive examination must be passed prior to admission to candidacy.

CONTINUOUS REGISTRATION OF DOCTORAL STUDENTS

All doctoral students must be registered for doctoral dissertation research course 600 (minimum of 3 hrs.) on a continuous basis starting when the doctoral research proposal is approved, admission to candidacy is accepted, or registration for course 600 is begun, whichever comes first, including ALL Summer terms and the semester in which the dissertation is approved and accepted by The Graduate School. A leave of absence may be requested for extenuating circumstances. The procedure can be found in the UTK Graduate catalog.

FINAL EXAMINATION FOR NON-THESIS, CAPSTONE PROJECT STUDENTS, THESIS AND DISSERTATION STUDENTS

A candidate presenting a thesis or dissertation must pass a final oral examination on all work offered for the degree. The examination is scheduled through the Registrar's Office. Failure to notify the Registrar's Office of the examination date will put the student at risk for graduating that semester. Final examinations not properly scheduled MUST be repeated. The final draft of the thesis must be distributed to the committee members at least two weeks prior to the date of the final examination. In case of a grade of "Fail", the candidate may not apply for re-examination until the following semester. The result of the second examination is final.

UT POLICY ON INSURANCE FOR INTERNATIONAL STUDENTS

All foreign national students registered with the University of Tennessee, Knoxville, are required to have comprehensive medical insurance. The policy for the 2007 academic year is provided by United Health Care. The premium must be paid before registration. Contact the Admission and Student Affairs Office (A104 ext. 432) or email Callie Taylor at ctaylor@utsi.edu for further information.

GENERAL SEMINAR

A number of seminars of interest to all UTSI students and general public will be offered throughout the semester.

FINAL EXAM DATES FOR SPRING SEMESTER 2008

STUDY PERIOD...April 28, 2008

FINAL EXAMS.....April 29, 30 & May 1, 2008

HONOR STATEMENT

The following Honor Statement is signed by all students applying to The Graduate School:

"An essential feature of The University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."

For official information on all UTK Graduate School policies, refer to the current UTK Graduate Catalog available in the Registrar's Office, A102.

The University of Tennessee Space Institute reserves the right to cancel any class with an insufficient number of students, or for other reasons.

THE UNIVERSITY OF TENNESSEE POLICY ON A DRUG-FREE CAMPUS AND WORKPLACE

In support of the Drug-Free Workplace Act of 1998 (Public Law 100-690) and the Drug-Free Schools and communities Act of 1989, the University of Tennessee is notifying all students, faculty, and staff of the following university policy approved by the UT Board of Trustees on 21 June 1990.

It is the policy of the University of Tennessee to maintain a safe and healthful environment for its students and employees. Therefore, university policy prohibits the unlawful use, manufacture, possession, distribution, or dispensing of drugs ("controlled substances" as defined in the Controlled Substances Act, 21 U.S.C. 812) and alcohol on university property or during university activities.

Violation of this policy is grounds for disciplinary action--up to and including immediate discharge for an employee and permanent dismissal of a student. Federal and state laws provide additional penalties for such unlawful activities, including fines and imprisonment (21 U.S.C. 841 et seq.; T.C.A. 39-6-401 et seq.). Local ordinances also provide various penalties for drug- and alcohol-related offenses. The university is bound to take all appropriate actions against violators, which may include referral for legal prosecution or requiring the individual to participate satisfactorily in an approved drug use or alcohol abuse assistance or rehabilitation program.

SPECIAL ANNOUNCEMENT

THOMAS JEFFERSON LECTURE

Thursday, April 10, 2008

(Tentative Date)

3:00 P.M.

UTSI Auditorium

There will be **NO** scheduled classes at this time by request of
Donald C. Daniel, PhD, UT Associate Vice President
UTSI Chief Operating Officer

Faculty will reschedule any afternoon classes tentatively scheduled
For April 10, 2008 between 2:30 – 3:45 p.m.
Contact the Registrar's Office
For available times and rooms for rescheduling

**THE UNIVERSITY RESERVES THE RIGHT TO REVISE ANY INFORMATION
LISTED IN THIS TIMETABLE OF CLASSES**

**THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE
SPRING SEMESTER 2008 COURSE LISTINGS**

AEROSPACE ENGINEERING

AE 500 Master's Thesis (1 - 15)
SEC. 001 Schulz
009 Antar
010 Flandro
011 Majdalani
012 Moeller
013 Steinhoff
014 Vakili
015 Moulden

AE 502 REGISTRATION FOR USE OF FACILITIES (1 - 15)
SEC. 002 Dr. Roy Schulz

AE 512 VISCOUS FLOW (3)
SEC. 001 (Videotaped at UTSI)
TIME: Monday and Thursday 1:00 – 2:15 E 112
TEXT: F. White: Viscous Flow; 2nd Ed., ISBN# 0-07-069712-4
PROFESSOR: Dr. Ahmad Vakili

Equations of viscous fluid flow; exact and approximate solution; laminar and turbulent flow; transition; separation; boundary layer theories; exact and approximate solution. Prereq. AE 521.

AE 522 AERODYNAMICS OF COMPRESSIBLE FLOWS II (3)
SEC. 001
TIME: Monday and Thursday 10:45 – 12:00 E211
TEXT: TBD
PROFESSOR: Dr. Gary Flandro

One-dimensional internal and external flow; waves; small perturbation theory; slender body theory; similarity rules; method of characteristics. Prerequisite: 521

AE 535 MECHANICAL VIBRATIONS (3)
SEC. 001 (Same as ME 534 & ES 534)
TIME: Monday and Thursday 7:45 – 9:00 E 211
TEXT: Lecture notes, handouts, reserved books form the Library
PROFESSOR: Dr. Gary Flandro

Vibrations of linear, discrete, undamped and damped systems. Lagrange's equations for Modal analysis. Laplace transform. Response to mechanical transients. Prereq: Undergraduate vibrations course.

*AE 539 CONTINUUM MECHANICS (3) **CANCELLED**
SEC. 001 (Same as ES 539 & ME 539)
TIME: Monday and Thursday 10:45 – 12:00 B 112
TEXT: L. E. Malvern: Introduction to the Mechanics of a Continuous Medium; Prentice Hall,
ISBN# 13 487603 2
PROFESSOR: Dr. T. H. Moulden

Cartesian tensors, transformation laws, basic continuum mechanics, concepts; stress, strain, deformation, constitutive equations. Conservation laws for mass, momentum, energy. Applications in solid and fluid mechanics.

AE 542 FLUID MECHANICS II (3)
SEC. 001 (Same as ES 542 & ME 542)
TIME: Tuesday and Friday 9:15 – 10:30 E 211
TEXT: 1. H. Tennekes & J. Lumley: A First Course in Turbulence, MIT, Latest Ed.
2. R.L. Panton: Incompressible Flow; Wiley Interscience; Latest publications
PROFESSOR: Dr. Basil Antar

Inviscid flow, boundary layers, laminar jets, wakes and shear layers. Transition to turbulence. Turbulent flow, Reynolds averaged equations, dynamics of turbulence, boundary free turbulent shear flow, turbulent channel's pipe flow, turbulent boundary layers.

AE 544 INTRODUCTION TO TRANSONIC FLOW (3)
SEC. 001
TIME: Tuesday and Friday 10:45 – 12:00 B112
TEXT: T. H. Moulden: Fundamentals of Transonic Flow; Krieger 1991; ISBN 0-89464-441-6
PROFESSOR: Dr. T. H. Moulden

Outline: This course will be concerned with the physical structure of transonic flows. Topics covered include the equations of motion, flow physics, shock—wave boundary layer interactions and the structure of a local supersonic flow region. Properties of transonic flow shock waves will also be discussed. Small disturbance theory is discussed to give added insight into the structure of transonic flows.

AE 557 AEROSPACE VEHICLE FLUTTER & VIBRATION (3)
SEC. 001
TIME: Monday and Thursday 9:15 – 10:30 E-211
TEXT: TBD
PROFESSOR: Dr. Roy Schulz

Aeroelastic phenomena. Structural and aerodynamic operators. Stability criteria for airfoils operating in oscillating stream. Two-and-three-dimensional flutter of wings, control surfaces and empennages. Prereq: 423, 551.

AE 595 SEMINARS: AEROSPACE and MECHANICAL SYSTEMS (1)
SEC. 001 Dr. Ahmad Vakili (Same as ME 595)

Seminars in all phases of Aerospace Engineering, reports on current research at UTK and UTSL. May be repeated.

AE 599 AIRCRAFT DESIGN (3)
SEC. 002 (Cross-Listed as AS506 Section 001) Videotaped from UTSI
TIME: Tuesday and Friday 1:00 – 2:15 E 112
TEXT: D.P. Raymer: Aircraft Design: A Conceptual Approach; AIAA Education Series;
3rd Ed., 1998. ISBN # 1-56347-281-0
PROFESSOR: Dr. U. Peter Solies

Review of air vehicle aerodynamics and performance, design process, compromise of conflicting requirements, economical, industrial, and legal aspects. Definition of mission requirements, synthesis and optimization techniques, safety and reliability, systems integration, standards and regulations, teamwork and decision-making process.

*AE 599 SPECIAL TOPICS IN AE: VORTICITY OF AERODYNAMICS (3) **CANCELLED**
SEC. 003
TIME: Monday and Thursday 10:45 – 12:00 E 210
TEXT: J. C. Wu: Elements of Vorticity Aerodynamics, 2005, 1st Ed., Tsinghai University Press
PROFESSOR: Dr. J. Z. Wu

As an applied branch of fluid dynamics, aerodynamics deals with forces produced by air or other fluids on bodies moving through it. The only strategy open to the founders of the low-speed (incompressible) aerodynamics a century ago was to seek simple model theories that could bypass the highly nonlinear flow details as much as possible but pinpoint the key physics crucial to the forces. This strategy is the most valuable legacy of those great pioneers. Today, although detailed data of a complicated flow field can be made available by numerical computation and advanced measurement, the physical mechanisms behind the aerodynamic forces by no means surface automatically from the data. Rather, they have to be revealed by theories. Therefore, it is still absolutely necessary to carry forward that great legacy. But for sorting out the key information from the huge ocean of data, modern theories should be as exact and general as possible, yet still simple and neat with in-depth physical insight.

This course introduces to students the elegance and power of classic circulation theory and its modern developments in vorticity aerodynamics. The power of this theory for understanding and diagnosing not only the forces on a conventional wing, but also highly unsteady forces such as those on a maneuvering MAV, on an insect or fish, or on an automobile or submarine, will be highlighted. Requisite background knowledge and the necessary mathematics for this theory will be developed as the course proceeds.

*AE 599 SPECIAL TOPICS IN AE: FUNDAMENTAL PROCESSES IN VISCOUS
FLUID MOTION (3) **CANCELLED**
SEC. 004
TIME: Tuesday and Friday 10:45 – 12:00 E210
TEXT: Lecture Notes (PPT) of the instructor.
MAJOR REFERENCES: J. Z. Wu, H. Y. Ma, and M. D. Zhou, Vorticity and Vortex Dyanmics,
Pringer-Verlag, 2006, Chapter 2.
PROFESSOR: Dr. J. Z. Wu

This course provides an effective way into the physical/mathematical essence of advanced fluid dynamics, gas dynamics, or external and internal aerodynamics, by introducing the two fundamental processes in a viscous compressible fluid: the compressing/expanding process represented by the pressure and characterized by the Mach number, and the shearing process represented by the vorticity and characterized by the Reynolds number. They can be easily

identified from the Navier-Stokes equation, and are coupled through the nonlinearity of the governing equations and boundary conditions. These processes and their coupling exist in all realistic flows. Only in certain simplified theoretical models the two processes could be decoupled and one of them be ignored; it is more often that, depending on specific situations, one process is primary and the other is a byproduct but may have feedback effect to the former.

The course is offered in particular to those who have learned undergraduate fluid dynamics or aerodynamics, and are facing advanced research projects involving complicated flow problems such as unsteady vortical separated flows, wave-vortex interactions and flow control, etc. The course starts from exemplifying the two processes in nature and technology, and then introduces the basic mathematic tool for analyzing the two processes, which is an applied review of vector and tensor operations. How the two processes are coupled will be analyzed and shown by many theoretical, numerical, or experimental examples.

AE 600 DOCTORAL & RESEARCH DISSERTATION (3 - 15)
 SEC. 001 Schulz
 005 Antar
 006 Flandro
 007 Majdalani
 008 Steinhoff
 009 Vakili
 010 Corda

AE 661 ADVANCED TOPICS IN COMPUTATIONAL FLUID DYNAMICS (3)
 SEC. 001
 TIME: TBD
 TEXT: TBD
 PROFESSOR: Dr. John Steinhoff

Modern approximation theory for Euler and Navier-Stokes conservation systems, compressible flow, hyperbolic forms, boundary conditions. Weak forms, extremization, finite element/finite volume/flux vector discrete implementations, a priori error estimates, accuracy, convergence, stability. Numerical linear algebra, approximate factorization, sparse matrix methods. Dissipation, Fourier spectral analysis, smooth and non-smooth solutions. (Same as Engineering Science 651; Mechanical Engineering 651.)

AE 681 ADVANCED VISCOUS FLOW THEORY (3)
 SEC. 001
 TIME: Monday and Thursday 2:30 – 3:45 E 210
 TEXT: Lecture Notes
 PROFESSOR: Dr. Trevor Moulden

Critical review of significance to governing equations. Nature of boundary layer approximation as singular perturbation problem. Uniqueness and existence of solutions. Application of group theory. Special problem areas of interest to students. The Navier Stokes Equations and their mathematical properties.

AE 690 ADVANCED TOPICS IN AE: NONLINEAR SYSTEM MODELING (3)
 SEC. 001
 TIME: Tuesday and Friday 7:45 – 9:00 E 211

TEXT: Ali H. Nayfeh: NONLINEAR INTERACTIONS Analytical, Computational, and Experimental Methods; Wiley Series in Nonlinear Science, John Wiley & Sons, ISBN# 0-471-17591-9 (Paperback)
PROFESSOR: Dr. Gary Flandro

This course introduces the solution of engineering problems requiring nonlinear interactions, bifurcation, and chaos. Many current problems of great practical significance require handling of nonlinear behavior. Nonlinearity gives rise to an entire universe of phenomena not experienced in linear systems. These include multiple solutions and jumps, limit cycles, natural-frequency shifts; subharmonic, superharmonic, and ultra subharmonic resonances; period multiplying, bifurcation, and chaos. The example of nonlinear combustion instability in rockets and jet engine combustors and similar nonlinear vibration problems will be used to demonstrate the new mathematical techniques and associated physical understanding required.

AE 690 ADVANCED TOPICS IN AE: LINEAR AND NONLINEAR WAVES (3)
SEC. 002 (Cross-list ES 681 Section 003)
TIME: Monday and Thursday 4:15 - 5:30 B 210
TEXT: GB. Witham: Linear and Nonlinear Waves
P.C. Drazin & R.S. Johnson: Solitons: An Introduction; ISBN# 0521336554
PROFESSOR: Dr. John Steinhoff

The basic properties of many important physical phenomena can often be modeled by partial differential equations with simple nonlinear terms. These range from pattern formation in water waves to predator-prey dynamics and optical pulse propagation in fibers. Representative classes of equations will be studied and their solutions characterized. An important sub-topic will be solitary waves and especially solitons. Solitons have recently been extensively studied as very important and interesting solutions of many nonlinear partial differential equations: they propagate without changing shape, even after interacting with each other, they are represented in many important physical phenomena, from optical pulses to tidal bores, and are studied as models of elementary particles. The course will consist of a survey of the field followed by a study of the methods of solving nonlinear partial differential equations which lead to soliton solutions. The emphases will be on physical arguments and analysis. Prereq: include Elementary Partial Differential Equations and Advanced Calculus.

AE 690 ADVANCED TOPICS IN AE: PERTURBATION METHODS IN
ENGINEERING II (3)
SEC. 006
TIME: Monday and Thursday 3:00 – 4:15 B210
TEXT: Instructor Notes and Handouts
PROFESSOR: Dr. Joseph Majdalani

Apply asymptotic methods to real life problems requiring the subtle use of perturbation theory. These involve analytical approximations to transcendental equations and differential equations encountered in modern research. By the end of the course, students will be able to: increase their confidence in the potential strength of perturbation techniques; better understand when and how perturbation methods can be applied; learn how to handle problems exhibiting nonlinear scales. Focus will be on propulsion related applications including the treatment of unsteady wave motion.

AVIATION SYSTEMS

AS 500 MASTER'S THESIS (1 - 15)
SEC. 001 Solies
003 Ranaudo
007 Corda
008 Collins

AS 502 REGISTRATION FOR USE OF FACILITIES (1-15)
SEC. 001 Dr. Stephen Corda

Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated.

AS 506 AIRCRAFT DESIGN (3)
SEC. 001 (Cross-Listed as AE599 Section 002) Videotaped from UTSI
TIME: Tuesday and Friday 1:00 – 2:15 E 112
TEXT: D. P. Raymer: Aircraft Design: A Conceptual Approach; AIAA Education Series; 3rd Ed., 1998. ISBN # 1-56347-281-0
PROFESSOR: Dr. U. Peter Solies

Review of air vehicle aerodynamics and performance, design process, compromise of conflicting requirements, economical, industrial, and legal aspects. Definition of mission requirements, synthesis and optimization techniques, safety and reliability, systems integration, standards and regulations, teamwork and decision-making process.

AS 510 SPECIAL TOPICS: INTRODUCTION TO AVIONICS II (3)
SEC. 001 (Videotaped at UTSI)
TIME: Tuesday and Friday 10:30 – 11:45 E 112
TEXT: Len Buckwalter: Avionics Training for Systems, Installation and Troubleshooting; Avionics Communications Inc, latest edition; ISBN 1-88-5544-21-9
PROFESSOR: Dr. Alfonso Pujol, Jr.

Avionic systems and communications, including distance measuring equipment, transponder, and radar altimeter. GPS/satellite navigation, electronic flight instrument system, cockpit voice and flight data recorders, weather detection, traffic alert and collision avoidance system, electrical systems, aviation bands and frequencies, and other topics are also discussed.

AS 510 SPECIAL TOPICS: SYSTEMS ENGINEERING (3)
SEC. 002 (Videotaped at UTSI)
TIME: Monday and Thursday 2:30 – 3:45 E113
TEXT: Systems Engineering Principle and Practice; Alexander Kossiakoff and William Sweet; ISBN 0-471-23443-5; Inviting Disaster – Lessons from the Edge of Technology; James R. Chiles; ISBN 0-06-662081-3; The Secret of Apollo, Systems Management in the American and European Space Programs; Stephen B. Johnson; ISBN 0-8018-8542-6.
PROFESSOR: Dr. John Muratore

The focus of this course is on engineering problem solving in multi-disciplinary applications with complex systems interactions. Instruction will be provided in methodologies and tools used to deal with large complex systems to deliver system

performance that meets user requirements. Methodologies discussed will include system life cycles, requirements development, verification and validation, engineering review processes, hazard analysis, fault trees, reliability block diagrams, system flow diagrams, weight and cost estimating, technical budget management, engineering economic analysis, interface control, and deterministic and monte carlo definition of integrated flight design environments. Special topics will include software integration, interconnect wiring, fault tolerance and redundancy management

AS 514 SYSTEMS FLIGHT TESTING (3)
SEC. 001 (Interactive from UTK to UTSI)
TIME: Tuesday and Thursday 10:00 – 11:15 (CST) E113
TEXT: TBD
PROFESSOR: Richard Ranaudo

Experimental test techniques for helicopter and airplane flight systems. Approach and design for testing airborne systems. Theory and operation of typical flight systems: aircraft systems, navigation systems, communications systems, and specific mission systems.

AS 521 EXPERIMENTAL FLIGHT MECHANICS: FIXED WING PERFORMANCE (3)
SEC. 001
TIME: Tuesday and Friday 8:00 - 9:15 Tullahoma Airport Classroom
TEXT: Ralph D. Kimberlin: Flight Testing of Fixed-Wing Aircraft; AIAA Education Series; ISBN# 1 56347 564 2
PROFESSOR: Dr. Stephen Corda and Dr. Peter Solies

This course will cover fundamental theories, flight test techniques, and data collection and analyses for fixed wing aircraft performance. Topics will include air data system calibration, takeoff and landing performance, turn performance, cruise performance, energy concepts, and aerodynamic modeling. Course structure will be weekly classroom academics with approximately 4-6 flight labs evenly distributed during the semester. This course is designed for full-time attendance during the semester and will not be offered as a Distance Learning course. Prerequisite AS 501 or consent of instructor.

AS 550 PROJECT IN AVIATION SYSTEMS (3)
SEC. 001 Corda
002 Solies
003 Collins
004 Ranaudo

Enrollment limited to Aviation Systems students in non-thesis program. May be repeated. Maximum 3 hrs allowed toward degree.

CHEMICAL ENGINEERING

ChemE 500 THESIS (1 - 15)
SEC. 008 Dr. Atul Sheth

COMPUTER SCIENCE

NOTE: Students interested in the Interdisciplinary Graduate Minor in Computational Science (IGMCS) at UTSI should contact Dr. Bruce Whitehead (bwhitehe@utsi.edu, 931-393-7296) for further information.

CS 472 NUMERICAL LINEAR ALGEBRA (3)
SEC. 003 (Same as Math 472)
TEXT: Burden & Faires: Numerical Analysis; 8th Ed., Brooks/Cole; ISBN: 0-534-38216-9
TIME: Monday 1:00 – 2:15 E211
Wednesday 1:00 – 2:15 E211
PROFESSOR: Dr. Kenneth Kimble

Direct and iterative methods for systems of linear equations. Solution of single nonlinear equations and nonlinear systems. Orthogonal decomposition, least squares and algebraic eigenvalue problem. Prereq: Numerical Algorithms 1 or consent of instructor. Recommended prereq: 453.

*CS 575 MATRIX THEORY AND TECHNIQUES IN NUMERICAL ANALYSIS (3)
SEC. 002 (Same as Math 575) **CANCELLED**
TIME: Monday and Thursday 1:00 – 2:15 B 112
TEXT: Lloyd N. Trefethen, David Bau III: Numerical Linear Algebra, SIAM: Society of Industrial and Applied Mathematics (June 1, 1997), ISBN# 0898713617
PROFESSOR: Dr. K. C. Reddy

Advanced topics in study of iterative and direct methods for large systems of linear equations: sparse matrix analysis, relationship to modern computer architectures. May be repeated. Maximum 9 hours. (Same as Math 575.) Prerequisites: 453, 471, and 472 or consent of instructor.

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

ECE 500 THESIS (1 – 15)
SEC. 001 Bomar
018 Smith
026 Pujol
027 Whitehead

ECE 501 PROJECT IN LIEU OF THESIS (3)
SEC. 001 Bomar
002 Smith
006 Pujol
007 Whitehead

ECE 506 DIGITAL SIGNAL PROCESSING II (3)
SEC. 002
TIME: Tuesday and Friday 9:15 – 10:30 F252
TEXT: TBD

PROFESSOR: Dr. Bruce Bomar

Filter properties in the Z and Fourier transform domains, structures for digital filters, sampling and reconstruction, hardware implementation of digital filters.

ECE 553 COMPUTER NETWORKS (3)

SEC. 002

TIME: Tuesday and Friday 1:00 – 2:15 E211

TEXT: James F. Kurose and Keith W. Ross; Computer Networking: A Top-Down Approach; Addison-Wesley; 4th Ed; ISBN # 0-321-49770-8.

PROFESSOR: Dr. Bruce Whitehead

Principles of computer networks with a focus on the Internet and TCP/IP protocol suite. In-depth study of several core issues and design options involved. Employs a top-down approach in the discussion from the application layer down to the physical layer. An emphasis is given on protocol design and performance analysis. Assignments that require hands-on networking and programming skills will be issued in order to solve concrete problems. Prereq: Proficiency in C language programming and debugging.

ECE 617 SPECIAL TOPICS IN SYSTEM THEORY I: MULTIDIMENSIONAL DIGITAL SIGNAL PROCESSING (3)

SEC. 006

TIME: Monday and Thursday 9:15 – 10:30 F253

TEXT: D.E. Dudgeon and M. Mersereau; Multidimensional Digital Signal Processing; Prentice Hall; Latest edition; ISBN # 0-13-604959-1.

PROFESSOR: Dr. L. Montgomery Smith

Advanced topics in multidimensional signal processing with special emphasis on 2-D filter design and implementation techniques. Topics to be covered include: (a) Multidimensional Signals and Systems: concepts of linearity, shift-invariance, periodicity, and frequency spectra; (b) Computation of the 2-D Discrete Fourier Transform: row-column decomposition methods and higher-radix FFTs; (c) Design and Implementation of 2-D FIR Filters: windowing, least-squares, McClellan transformation methods; and (d) Design and Implementation of 2-D Recursive (IIR) Filters: the 2-D z-Transform, stability criteria, canonical forms, state-space realizations, numerical design techniques. Grade will be based upon homework problems, computer projects, and term project involving independent study. Prerequisite: Consent of instructor required.

ENGINEERING SCIENCE

ES 500 Master's Thesis (1 - 15)

SEC. 001 Schulz

010 Antar

011 Flandro

012 Majdalani

013 Moeller

014 Steinhoff

015 Vakili

ES 534 MECHANICAL VIBRATIONS

SEC. 001 (Same as AE 535 & ME 534)

TIME: Monday and Thursday 7:45 – 9:00 E 211
TEXT: Lecture notes, handouts, reserved books form the Library
PROFESSOR: Dr. Gary Flandro

Vibrations of linear, discrete, undamped and damped systems. Lagrange's equations for Modal analysis. Laplace transform. Response to mechanical transients. Prereq: Undergraduate vibrations course.

*ES 539 CONTINUUM MECHANICS (3) **CANCELLED**
SEC. 001 (Same as AE 539 & ME 539)
TIME: Monday and Thursday 10:45 – 12:00 B 112
TEXT: L. E. Malvern: Introduction to the Mechanics of a Continuous Medium; Prentice Hall, ISBN# 13 487603 2
PROFESSOR: Dr. T. H. Moulden

Cartesian tensors, transformation laws, basic continuum mechanics, concepts; stress, strain, deformation, constitutive equations. Conservation laws for mass, momentum, energy. Applications in solid and fluid mechanics.

ES 542 FLUID MECHANICS II (3)
SEC. 001 (Same as AE 542 & ME 542)
TIME: Tuesday and Friday 9:15 – 10:30 E 211
TEXT: 1. H. Tennekes & J. Lumley: A First Course in Turbulence, MIT, Latest Ed.
2. R.L. Panton: Incompressible Flow; Wiley Interscience; Latest publications
PROFESSOR: Dr. Basil Antar

Inviscid flow, boundary layers, laminar jets, wakes and shear layers. Transition to turbulence. Turbulent flow, Reynolds averaged equations, dynamics of turbulence, boundary free turbulent shear flow, turbulent channel's pipe flow, turbulent boundary layers.

ES 568 OPTICAL ENGINEERING II (4)
SEC: 004 (Continuation of ES 566)
TIME: Tuesday and Friday 10:45 – 12:00 F253
TEXT: L.M. Smith; Fundamental Principles of Optical Engineering; (Lecture Notes to be printed and sold in the UTSI bookstore)
PROFESSOR: Dr. L. Montgomery Smith

Applications of Fourier Optics: Fourier transforms and linear systems, frequency analysis of optical imaging systems, optical image processing and phase visualization techniques. Holography: recording, reconstruction, and practical considerations. Light Sources: blackbodies, gas discharge lamps, light emitting diodes, and lasers. Light Detectors: photomultiplier tubes, semiconductor devices, noise sources, detection schemes.

ES 595 SEMINARS: ENGINEERING SCIENCE (1)
SEC. 003 Dr. John Steinhoff

Seminars in all phases of Engineering Science, reports on current research at UTK and UTSI. May be repeated.

ES 600 DOCTORAL & RESEARCH DISSERTATION (1 – 15)
SEC. 001 Schulz

004 Antar
005 Flandro
006 Majdalani
007 Steinhoff
008 Vakili

ES 651 ADVANCED TOPICS IN COMPUTATIONAL FLUID DYNAMICS (3)
SEC. 001
TIME: TBD
TEXT: TBD
PROFESSOR: Dr. John Steinhoff

Modern approximation theory for Euler and Navier-Stokes conservation systems, compressible flow, hyperbolic forms, boundary conditions. Weak forms, extremization, finite element/finite volume/flux vector discrete implementations, a priori error estimates, accuracy, convergence, stability. Numerical linear algebra, approximate factorization, sparse matrix methods. Dissipation, Fourier spectral analysis, smooth and non-smooth solutions. (Same as Aerospace Engineering 661; Mechanical Engineering 651.)

ES 681 ADVANCED TOPICS IN ENGINEERING MECHANICS: LINEAR AND
NONLINEAR WAVES (3)
SEC. 002 (Cross-list AE 690 Section 002)
TIME: Monday and Thursday 4:00 - 5:15 B 210
TEXT: GB. Witham: Linear and Nonlinear Waves
P.C. Drazin & R.S. Johnson: Solitons: An Introduction; ISBN# 0521336554
PROFESSOR: Dr. John Steinhoff

The basic properties of many important physical phenomena can often be modeled by partial differential equations with simple nonlinear terms. These range from pattern formation in water waves to predator-prey dynamics and optical pulse propagation in fibers. Representative classes of equations will be studied and their solutions characterized. An important sub-topic will be solitary waves and especially solitons. Solitons have recently been extensively studied as very important and interesting solutions of many nonlinear partial differential equations: they propagate without changing shape, even after interacting with each other, they are represented in many important physical phenomena, from optical pulses to tidal bores, and are studied as models of elementary particles. The course will consist of a survey of the field followed by a study of the methods of solving nonlinear partial differential equations which lead to soliton solutions. The emphases will be on physical arguments and analysis. Prereq: include Elementary Partial Differential Equations and Advanced Calculus.

ENGINEERING MANAGEMENT

EM 501 CAPSTONE PROJECT (3 - 6)
SEC. 001 Students not located at Tullahoma or Oak Ridge
SEC. 003 Students located at Tullahoma or Oak Ridge
PROFESSORS: Dr. Denise Jackson, P.E. and Dr. Gregory Sedrick, P.E.

Application-oriented project to show competence in major academic area. Enrollment limited to Engineering Management students in non-thesis program. May be repeated. Maximum 6 hours.

EM 502 REGISTRATION FOR USE OF FACILITIES (1 – 15)
SEC. 001 Students not located at Tullahoma or Oak Ridge
SEC. 003 Students located at Tullahoma or Oak Ridge
PROFESSORS: Dr. Denise Jackson, P.E. and Dr. Gregory Sedrick, P.E.

Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before a degree in Industrial Engineering (Engineering Management) is completed. May not be used toward degree requirements.

EM 533 THEORY AND PRACTICE OF ENGINEERING MANAGEMENT (3)
SEC. 001 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 002 UTSI Students participating elsewhere including web or CD
SEC. 005 UTK Students participating at Knoxville DE Classrooms
SEC. 006 UTK Students participating via web or CD
TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm
TIME: Thursday 4:00 – 6:35 E113
PROFESSOR: Dr. Gregory Sedrick, PE

Manager's perspective; business definition; strategic planning and management; marketing and competition in global economy; finance; organization; systems thinking; team building; corporate culture and leadership in new organization; and quality, empowerment, and learning organizations. Principle application to work settings and case studies.

EM 534 FINANCIAL MANAGEMENT (3)
SEC. 001 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 002 UTSI Students participating elsewhere including web or CD
SEC. 003 UTK Students participating at Knoxville DE Classrooms
SEC. 004 UTK Students participating via web or CD
TIME: Tuesday 4:00 – 6:35 CST E113
TEXT: Go to http://www.utsi.edu/academics/ieandem/student_services.htm
PROFESSOR: Dr. George Garrison, PE

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.

EM 541 MANAGING CHANGE AND IMPROVEMENT IN TECHNICAL
ORG. (3)
SEC. 001 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 002 UTSI Students participating elsewhere including web or CD
SEC. 003 UTK Students participating at Knoxville DE Classrooms
SEC. 004 UTK Students participating via web or CD
TIME: Monday 4:00-635 CST 5:00-735 EST Oak Ridge
PROFESSOR: Dr. Denise Jackson, PE

Current topics, theories, and applications for managing change and innovation of performance improvement in organizations. Multi-initiative approaches: quality management, organizational effectiveness, employee empowerment, performance measurement, and application of statistical tools and techniques. Self-assessment for

performance excellence. Change agent, team building, and leadership issues. Case studies.

INDUSTRIAL ENGINEERING

IE 500 THESIS (1-15)
SEC. 004 Dr. Denise Jackson, PE
SEC. 012 Dr. Gregory Sedrick, PE

IE 514 ADVANCED INFORMATION SYSTEMS ANALYSIS & DESIGN (3)
SEC. 001 All Students participating at Knoxville
SEC. 002 UTK Students participating elsewhere including web or CD
SEC. 003 UTSI Students participating elsewhere including web or CD
TIME: CENTRA
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Xueping Li

Systems analysis and systems control concepts applied to systems of information. Role of IE in office and factory of future. Management support systems, decision support systems, and integrated support systems.

IE 518 ADVANCED ENGINEERING ECONOMIC ANALYSIS (3)
SEC. 001 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 002 UTSI Students participating elsewhere including web or CD
SEC. 003 UTK Students participating at Knoxville DE Classrooms
SEC. 004 UTK Students participating via web or CD
TIME: Wednesday 4:00 – 6:35 E113
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Gregory Sedrick, P.E.

Application of engineering economic analysis in complex decision situations. Inflation and price changes; uncertainty evaluation using non-probabilistic techniques; capital financing and project allocation; evaluations involving equipment replacement, investor-owned utilities, and public works projects; probabilistic risk analysis including computer simulation and decision trees; multi-attribute decision analysis; and other advanced topics. Prereq: EM537 OR both 1. Engineering Economy (IIE405 or equivalent) and 2. Probability and Statistics for Scientists and Engineers, (IIE205 or equivalent).

IE 527 LEAN PRODUCTION SYSTEMS (3)
SEC. 001 All Students participating at Knoxville
SEC. 004 UTK Students participating elsewhere including web or CD
SEC. 005 UTSI Students participating elsewhere including web or CD
TIME: CENTRA
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Rupey Sawhney

Characteristics and performance of mass and lean production systems. Lean production concepts and principles. Planning, designing and implementing lean production systems: line balancing, set-up time reduction, cost management, maintenance support and other selected topics. Application at enterprise level to achieve strategic competitive goals. Prereq: 515 or consent of instructor.

MATERIALS SCIENCE

MSE 500 THESIS (1 – 15)
SEC. 002 Dr. William Hofmeister

MSE 511 FUNDAMENTALS OF MATERIALS SCIENCE AND ENGINEERING I (3)
SEC. 001
TIME: Tuesday and Friday 2:30 – 3:45 F253
TEXT: TBD
PROFESSOR: Dr. William Hofmeister

Chemical bonding, structures, defects, scattering, thermodynamics, diffusion, phase diagrams, microstructures and phase transformations.

*MSE 540 BASIC POLYMER CHEMISTRY (3) **CANCELLED**
SEC 001
TIME TBD
TEXT: TBD
PROFESSOR Dr. Zhongren Yue

Synthesis, reactions and degradation of polymers. Molecular characterization: solution methods and spectroscopy.

MSE 576 SPECIAL TOPICS IN MS&E: NANOMATERIALS (3)
SEC. 004
TIME: Tuesday and Friday 1:00 – 2:15 F252
TEXT: TBD
PROFESSOR: Dr. Jackie Johnson

Physics and chemistry of surfaces. Zero, one, and two-dimensional nanostructures: nanoparticles, nanowires and nanorods, thin films. Special classes of nanomaterials, fabrication of nanostructures, characterization of nanomaterials, applications of nanomaterials, biofunctionalization of magnetic nanoparticles, nanoparticles for tumor-targeted gene therapy, nanosensors and Feynman's vision.

MSE 600 DIRECT DOCTORAL DISSERTATION (1-15)
SEC. 002 Dr. William Hofmeister

MATHEMATICS

MATH 431 DIFFERENTIAL EQUATIONS II (3)
SEC. 001
TIME: Tuesday and Friday 2:30 – 3:45 B112
TEXT: Class Notes
PROFESSOR: Dr. T. H. Moulden

First order equations. The matrix eigenvalue problem and systems of first order linear equations. Solution in series, Laplace transforms and Green's functions.

MATH 435 PARTIAL DIFFERENTIAL EQUATIONS (3)

SEC. 003

TIME: Monday and Thursday 9:15 – 10:30 B210

TEXT: Richard Haberman: Applied Partial Differential Equations with Fourier Series and Boundary Value Problems; Prentice Hall; 4th Ed., ISBN# 013-065243-1

PROFESSOR: Dr. Boris Kupershmidt

Separation of variables, Fourier series, solution of Laplace, wave and heat equations. Prereq: Differential Equations and Calculus III.

MATH 472 NUMERICAL LINEAR ALGEBRA (3)

SEC. 003 (Same as CS 472)

TEXT: Burden & Faires: Numerical Analysis; 8th Ed., Brooks/Cole; ISBN: 0-534-38216-9

TIME: Monday 1:00 – 2:15 E211

Wednesday 1:00 – 2:15 E211

PROFESSOR: Dr. Kenneth Kimble

Direct and iterative methods for systems of linear equations. Solution of single nonlinear equations and nonlinear systems. Orthogonal decomposition, least squares and algebraic eigenvalue problem. Prereq: Numerical Algorithms 1 or consent of instructor. Recommended prereq: 453.

MATH 500 MASTER'S THESIS (1 - 15)

SEC. 003 Dr. Boris Kupershmidt

MATH 518 MATHEMATICAL METHODS IN PHYSICS (3)

SEC. 001 (Same as Phys 572)

TIME: Monday and Thursday 2:30 – 3:45 B 210

TEXT: G. Arfken: Mathematical Methods for Physicists; 5th Ed., Harcourt/Academic Press ISBN# 0-12-059825-6

PROFESSOR: Dr. Boris Kupershmidt

Linear vector spaces, matrices, tensors, curvilinear coordinates, functions of a complex variable, partial differential equations and boundary value problems, Green's functions, integral transforms, integral equations, spherical harmonics, Bessel functions, calculus of variations. Prereq: Advanced calculus and differential equations. Must be taken in sequence. (Same as Physics 571-572).

*MATH 575 MATRIX THEORY AND TECHNIQUES IN NUMERICAL ANALYSIS (3)

SEC. 002 (Same as CS 575) **CANCELLED**

TIME: Monday and Thursday 1:00 – 2:15 B 112

TEXT: Lloyd N. Trefethen, David Bau III: Numerical Linear Algebra, SIAM: Society of Industrial and Applied Mathematics (June 1, 1997), ISBN# 0898713617

PROFESSOR: Dr. K. C. Reddy

Advanced topics in study of iterative and direct methods for large systems of linear equations: sparse matrix analysis, relationship to modern computer architectures. May be repeated.

Maximum 9 hours. (Same as Computer Science 575.) Prerequisites: 453, 471, and 472 or consent of instructor.

MECHANICAL ENGINEERING

ME 500 MASTER'S THESIS (1 - 15)
SEC. 001 Schulz
021 Antar
022 Flandro
023 Majdalani
024 Moeller
025 Steinhoff
026 Vakili

ME 512 HEAT TRANSFER II (3)
SEC. 001
TIME: Tuesday and Friday 1:00 – 2:15 E 210
TEXT: Adrain Bejan: Convection Heat Transfer; 2nd Ed., John Wiley & Sons,
ISBN# 0471579726
PROFESSOR: Dr. Basil Antar

This course is a continuation of heat transfer, covering convection and thermal radiation heat transfer. Prereq: ME 511 or consent of instructor.

ME 522 THERMODYNAMICS II (3)
SEC. 001 Videotaped from UTSI
TEXT: Richard E. Sonntag, Clalus Borgnakke, and Gorgon J. Van Wylene, Fundamentals of Thermodynamics, 6th Ed., John Wiley & Sons, Inc., 2003, ISBN 0-471-15232-3
TIME: Monday and Thursday 9:15 – 10:30 E 112
PROFESSOR: Dr. Frank Collins

Macroscopic thermodynamics, including First and Second Law analyses, availability, phase and chemical equilibrium criteria, combustion, gas mixtures, and property relations, determination of thermodynamic properties from molecular structure, spectroscopic data, kinetic theory, statistical mechanics, quantum physics, Schrodinger equation. Prerequisites: 332.

ME 534 MECHANICAL VIBRATIONS
SEC. 001 (Same as AE 535/ES 534)
TIME: Monday and Thursday 7:45 – 9:00 E 211
TEXT: Lecture notes, handouts, reserved books form the Library
PROFESSOR: Dr. Gary Flandro

Vibrations of linear, discrete, undamped and damped systems. Lagrange's equations for Modal analysis. Laplace transform. Response to mechanical transients. Prereq: Undergraduate vibrations course.

*ME 539 CONTINUUM MECHANICS (3) **CANCELLED**
SEC. 001 (Same as ES 539 & AE 539)
TIME: Monday and Thursday 10:45 – 12:00 B 112

TEXT: L. E. Malvern: Introduction to the Mechanics of a Continuous Medium; Prentice Hall, ISBN# 13 487603 2

PROFESSOR: Dr. T. H. Moulden

Cartesian tensors, transformation laws, basic continuum mechanics, concepts; stress, strain, deformation, constitutive equations. Conservation laws for mass, momentum, energy. Applications in solid and fluid mechanics.

ME 542 FLUID MECHANICS II (3)

SEC. 001 (Same as AE 542 & ES 542)

TIME: Tuesday and Friday 9:15 – 10:30 E 211

TEXT: 1. H. Tennekes & J. Lumley: A First Course in Turbulence, MIT, Latest Ed.

2. R.L. Panton: Incompressible Flow; Wiley Interscience; Latest publications

PROFESSOR: Dr. Basil Antar

Inviscid flow, boundary layers, laminar jets, wakes and shear layers. Transition to turbulence. Turbulent flow, Reynolds averaged equations, dynamics of turbulence, boundary free turbulent shear flow, turbulent channel's pipe flow, turbulent boundary layers.

ME 552 MECHANICAL DESIGN (3)

SEC. 001 (Videotaped at UTSI)

TIME: Tuesday and Friday 9:15 – 10:30 E113

TEXT: M. F. Spotts: Design of Machine Elements; Latest Ed, Prentice-Hall, Inc.

ISBN# 0-13-200593-X

PROFESSOR: Dr. Louis Deken

This course concentrates on the back ground and application of stress analysis in the design of mechanical systems. Topics will include: fundamental principles of stress and factors of safety in design, linear elastic fracture mechanics, and design of shafting, connections, springs, bearings, etc. The design principles will be presented and attention will focus on the limitations imposed by the assumptions.

ME 582 ROCKET PROPULSION II (3)

SEC. 001

TIME: Tuesday and Friday 2:30 – 3:45 E211

TEXT: TBD

PROFESSOR: Dr. Roy Schulz

Solid propellant rocket performance, homogeneous and heterogeneous propellant chemistry and combustion system performance, thermal decomposition and gas phase reaction models; effect of chamber pressure and additives on solid propellant burn rates, erosive burning; analysis of two-phase solid rocket exhaust flow. Introduction to nuclear and electric propulsion; electrical resistance and electric field (ion) engine performance, magnetohydrodynamic thrusters, traveling wave thrusters; exotic propulsion systems.

ME 585 TURBOMACHINERY SYSTEMS II (3)

SEC. 001

TIME: Tuesday and Thursday 4:00 – 5:30 E 112

TEXT: Jack D. Mattingly: Elements of Gas Turbine Propulsion; 1st Ed., AIAA Educator Series;

ISBN# 1-56347-778-5

PROFESSOR: Dr. Milt Davis

The course will provide an in-depth analysis of component performance for compressors, turbines, nozzles, inlets, combustors. Compressor and turbine analysis will include: the Euler turbomachinery equation, velocity triangles, degree of reaction, blade performance and efficiency, and stage loading. Axial and centrifugal turbomachines will be analyzed. Combustors and augmentor performance will be studied. Inlet and nozzle performance will be analyzed and their integration with the full gas turbine engine will be studied. The course will emphasize the use of numerical simulations as tools for use in analyzing gas turbine engine/component performance.

*ME 587 DYNAMIC MODELING AND SIMULATION (3) **CANCELLED**
SEC. 001
TIME: Monday and Thursday 1:00 – 2:15 F 253
TEXT: Instructor Notes
PROFESSOR: Dr. George Havener

Theoretical models for a variety of engineering systems are developed from first principles and analyzed using both analytical and numerical methods. Generalized solutions are studied to determine system responses and failure modes. Emphasis is placed on developing good engineering models involving first and second order differential equations, systems of equations, partial differential equations and finite differencing. Systems applications involve mechanical, electrical and aero-thermal engineering fundamentals.

ME 590 SELECTED ENGINEERING PROBLEMS (2-6)
SEC. 001
PROFESSOR: Dr. Roy Schulz

ME 595 SEMINARS: AEROSPACE & MECHANICAL SYSTEMS (1)
SEC. 001 Dr. Ahmad Vakili (Same as AE 595)

Seminars in all phases of Mechanical Engineering, reports on current research at UTK and UTSI. May be repeated.

ME 599 SPECIAL TOPICS IN ME: PLASMA RADIATION (3)
SEC. 008
TIME: Tuesday and Friday 9:15 – 10:30 E210
TEXT: Robert Spiegel and John R. Howell; Thermal Radiation Heat Transfer; 3rd Ed.; Hemisphere Publishing Corporation, Washington, DC; ISBN # 0-89116-271-2
SUPPLEMENTAL TEXT: Maher I. Boulos, Pierre Fauchais and Emil Pfender; Thermal Plasmas: Fundamentals and Applications; Vol. 1, Plenum Press; ISBN # 0-306-44607-3
PROFESSOR: Dr. Trevor Moeller

ME 599 SPECIAL TOPICS IN ME: HYBRID ROCKET PROPULSION (3)
SEC. 012
TEXT: Martin J. Chiaverini and Kenneth K. Kuo; Fundamentals of Hybrid Rocket Combustion and Propulsion; American Institute of Aeronautics; ISBN # 1563477033.
TIME: Tuesday and Friday 3:00 – 4:15 B210
PROFESSOR: Dr. Joseph Majdalani and Mr. Paul Gloyer

This course reviews the fundamentals of hybrid rocket propulsion with special emphasis on application-based design and system integration, propellant selection, flow and regression rate modeling, solid fuel pyrolysis, scaling effects, transient behavior, and combustion instability. Advantages and disadvantages of both conventional and swirl-driven vortex hybrid configurations are examined. Course includes testing of laboratory-scale hybrid rockets.

Prereq: ME 581, or instructor's consent.

ME 600 DOCTORAL and RESEARCH DISSERTATION (3 - 15)
 SEC. 001 Schulz
 016 Antar
 017 Majdalani
 018 Flandro
 019 Vakili
 021 Steinhoff
 022 Moeller

ME 651 ADVANCED TOPICS IN COMPUTATIONAL FLUID DYNAMICS (3)
 SEC. 001
 TIME: TBD
 TEXT: TBD
 PROFESSOR: Dr. John Steinhoff

Modern approximation theory for Euler and Navier-Stokes conservation systems, compressible flow, hyperbolic forms, boundary conditions. Weak forms, extremization, finite element/finite volume/flux vector discrete implementations, a priori error estimates, accuracy, convergence, stability. Numerical linear algebra, approximate factorization, sparse matrix methods. Dissipation, Fourier spectral analysis, smooth and non-smooth solutions. (Same as Aerospace Engineering 661; Engineering Science 651.)

PHYSICS

PHYS 500 MASTER'S THESIS (1 - 15)
 SEC. 002 Crater
 003 Lewis
 004 Davis
 005 Parigger
 006 Chen
 013 McGregor

PHYS 503 PHYSICS COLLOQUIUM (1)
 SEC. 004
 TIME: Thursday 2:30 – 3:45 CLA Lab
 PROFESSOR: Dr. Ying Ling Ann Chen

Lectures and discussion on current research topics. Continuous registration required for current graduate students.

PHYS 507 CONTEMPORARY OPTICS (3)
SEC. 003
TIME: Monday and Thursday 10:45 – 12:00 CLA Conference Room
PROFESSOR: Dr. Lloyd Davis

Topics in geometrical, physical, Fourier, and nonlinear optics and introductory laser physics. Extensive use of computer calculations and design of practical and sophisticated optical systems.

PHYS 514 PROBLEMS IN THEORETICAL PHYSICS II (4)
SEC. 002 (Interactive Transmission from Knoxville)
TIME: Wednesday 10:15 – 11:30 E 113
TEXT: Core Concepts in Physics
PROFESSOR: Dr. Marianne Breinig

A course in Calculus based physics with 135, satisfies prerequisite for 200 level and beyond. Alternative to honors Physics 137–138 for physics majors. 3 hours lecture, 2 hours lab. Coreq: Mathematics 141-142.

PHYS 522 QUANTUM MECHANICS (3)
SEC. 002
TIME: Monday and Thursday 9:15 – 10:30 B112
TEXT: Sakurai: Quantum Mechanics; Addison Wesley
PROFESSOR: Dr. Horace Crater

Fundamental principles of quantum mechanics, free particle, harmonic oscillator, hydrogenation, angular momentum, electron spins, particles in electric and magnetic fields, perturbation theory, variational methods, scattering theory. Application of quantum mechanics to problems of atomic, molecular, nuclear, and solid state physics. Prereq: 521.

PHYS 541 ELECTROMAGNETIC THEORY (3)
SEC. 002
TIME: Monday and Thursday 2:30 – 3:45 E211
TEXT: TBD
PROFESSOR: Dr. Horace Crater

Review of electrostatics, magnetostatics, and quasi-static problems; Maxwell's field equations and their solutions in dielectric and conducting media; electrodynamics and relativity retarded potentials and gauge transformations, radiation produced by accelerating charges.

PHYS 551 STATISTICAL MECHANICS (3)
SEC. 001
TIME: Monday and Thursday 2:30 – 3:45 F252
TEXT: Lecture notes, with references to classical books such as D. McQuarrie "Statistical Mechanics"(ISBN 1891389157), H. Callen "Thermodynamics and Introduction to Thermostatistics"(ISBN 0-471-86256-8), L Reichl, " A modern Course in Statistical Physics" (ISBN 0-471-59520-9), and references to selected on-line texts, e.g., see <http://www-fl.ijs.si/~vilfan/SM/> and/or a collection of texts at <http://jeanrene.chazottes.googlepages.com/statisticalmechanics>
PROFESSOR: Dr. Christian Parigger

Ergodic theory, classical ensemble theory, quantum mechanical ensembles, relation of statistical mechanics to thermodynamics, transport theory and approach to equilibrium, phase transition, fluctuations and correlations. (DE) Prerequisite(s): 521, 531, and 571.

PHYS 572 MATHEMATICAL METHODS IN PHYSICS (3)
SEC. 001 (Same as Math 518)
TIME: Monday and Thursday 2:30 – 3:45 B 210
TEXT: G. Arfken: Mathematical Methods for Physicists; 5th Ed., Harcourt/Academic Press
ISBN# 0-12-059825-6
PROFESSOR: Dr. Boris Kupershmidt

Linear vector spaces, matrices, tensors, curvilinear coordinates, functions of a complex variable, partial differential equations and boundary value problems, Green's functions, integral transforms, integral equations, spherical harmonics, Bessel functions, calculus of variations. Prereq: Advanced calculus and differential equations. Must be taken in sequence.

PHYS 573 NUMERICAL METHODS IN PHYSICS (3)
COMMENT: This is a course recognized for the new interdisciplinary program
SEC. 008
TIME: Tuesday and Friday 1:00 – 2:15 F253
TEXT: "Numerical Recipes, The Art of Scientific Computing, THIRD EDITION," W. H. Press et al., ISBN 978-0521-88068-8, or electronic book available on Jan-1 2008; selected material/problems from "Computational Physics, Problem Solving with Computers, Second, Revised and Enlarged Edition," R.H. Landau et al., ISBN 978-3-527-40626-5; and other selected lecture notes and electronic references.
PROFESSOR: Dr. Chris Parigger

Numerical methods for solution of physical problems, use of digital computers, analysis of errors. Prereq: 571 or consent of instructor.

PHYS 599 SEMINAR IN MODERN PHYSICS: FLUORESCENCE SPECTROSCOPY (1)
SEC. 007
TIME: TBD
TEXT: TBD
PROFESSOR: Dr. Ying Ling Ann Chen

PHYS 600 DOCTORAL & RESEARCH DISSERTATION (3 - 15)
SEC. 002 Crater
003 Lewis
004 Davis
005 Parigger
006 Chen

*PHYS 611 ADVANCED QUANTUM MECHANICS AND FIELD THEORY (3)

CANCELLED

SEC. 001

TIME: Tuesday and Friday 10:45 – 12:00 F252

TEXT: TBD

PROFESSOR: Dr. Chris Parigger

Survey of problems and methods. Topics of current interest. Intended for all graduate students.

PHYS 642 ADVANCED TOPICS IN MODERN PHYSICS (3)

SEC. 003

TIME: Monday and Thursday 1:00 – 2:15 B210

TEXT: TBD

PROFESSOR: Dr. Horace Crater

Advanced theoretical or experimental topics not covered in other courses. May be repeated with consent of department. Maximum 9 hrs.

PHYS 643 COMPUTATIONAL PHYSICS (3)

SEC. 001

TIME: Monday and Thursday 10:45 – 12:00 F252

TEXT: TBD

PROFESSOR: Dr. Christian Parigger

Developing computer algorithms for solving representative problems in various fields of physics, celestial dynamics in astrophysics, boundary value problems in electromagnetism, atomic and nuclear structures, band structure in solid state physics, transport problems in statistical mechanics, Monte Carlo simulation of liquids, fitting and interpolation of data, correlation analysis, or optimization strategy. Prerequisite(s): 521, 531 and 571.

Spring 2008 Registration Announcement



University of Tennessee Space Institute



On-Line Registration
Instructions Inside
<http://cpo.utk.edu>

411 B.H. Goethert Parkway
Tullahoma, TN 37388-9700
888-822-8874 x-228
www.utsi.edu

