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411 P.H. Goelbert Parkway
Tullahoma, TN 37388-9700
888-877-8874 x 228
www.utsi.edu

See Inside for Online Registration Instructions
<https://cpo.utk.edu/CPOWeb>

CALENDAR --- FALL SEMESTER 2009

| | |
|--|-----------------------------------|
| Priority Registration..... | March 9, 2009 – August 11, 2009 |
| Fall 2009 Graduation Application Deadline | August 6, 2009 |
| Admission to Candidacy Forms due for Fall 2009 Commencement | August 6, 2009 |
| Late Registration and late fees begin | August 12, 2009 – August 28, 2009 |
| Classes begin..... | August 19, 2009 |
| Last Day to drop without “W” on the transcript, change to/from audit, add a course without the instructor’s signature..... | August 28, 2009 |
| Labor Day Holiday | September 7, 2009 |
| Graduation Fee Payment Deadline | September 21, 2009 |
| Last day to add/change credit or grading options with signatures | September 29, 2009 |
| Fall Break (No Classes) | October 15 – 16, 2009 |
| Last day to meet with consultant for Thesis/Dissertation Preliminary Review | October 14, 2009 |
| Tentative deadline to purchase cap/gown and order hood | October 16, 2009 |
| Last day to register to attend graduate hooding | October 30, 2009 |
| Last day to schedule final exam (thesis) | October 23, 2009 |
| Last day to schedule final exam (non-thesis/capstone students)..... | October 23, 2009 |
| Last day to schedule final exam (dissertation)..... | October 30, 2009 |
| Last day to take final exam (thesis/dissertation students)..... | November 6, 2009 |
| Last day to take final comprehensive exam (non-thesis/capstone students)..... | November 6, 2009 |
| Last day to drop with a “W” full session courses | November 10, 2009 |
| Thesis/Dissertation Deadline (Electronic)..... | November 20, 2009 |
| Report of thesis/dissertation defense or final examination (Pass/Fail Form)..... | November 20, 2009 |
| Thanksgiving Holiday..... | November 26 & 27, 2009 |
| Deadline for submission of Admission to Candidacy for students graduating Spring 2010..... | December 1, 2009 |
| All “ INCOMPLETES ” must be removed for Graduation..... | December 1, 2009 |
| Classes End | December 1, 2009 |
| Total withdrawal from the University Deadline | December 1, 2009 |
| Study Period..... | December 2, 2009 |
| Exam Period..... | December 3, 4, & 7, 2009 |
| Graduate Hooding (UTK) | December 11, 2009 |
| COMMENCEMENT (UTK) | December 13, 2009 |
| Second thesis/dissertation deadline (Student will receive diploma May 2010 But do not have to register for Spring 2010) (Defense Completed by December 1, 2009)..... | January 8, 2010 |

SPRING SEMESTER 2010

| | |
|--|-------------------------------|
| Priority Registration for Spring Semester 2010 begins at UTK | Sept. 28, 2009 – Jan. 6, 2010 |
| Final Registration for UTSI students | TBD |
| Classes begin..... | January 13, 2010 |
| Martin Luther King Day (Holiday)..... | January 18, 2010 |
| Spring Break | March 8 – 12, 2010 |
| Spring Recess - Good Friday Holiday | April 2, 2010 |
| Classes End | April 30, 2010 |
| Study Period..... | May 1, 2, & 3, 2010 |
| Exam Period..... | May 4, 5, 6, 7, 10 & 11, 2010 |
| Graduate Hooding Ceremony (UTK) | May 13, 2010 |
| Commencement (UTK) | May 14, 2010 |

**FALL SEMESTER 2009
FINAL STUDY DAY AND EXAM SCHEDULE**

LAST DAY OF CLASSESDecember 1, 2009

STUDY PERIODDecember 2, 2009

FINAL EXAMS - - - December 3, 4, & 7, 2009

REGULAR CLASS TIME (Same Classroom) EXAM TIME

1ST Day - Thursday, December 3, 2009

| | | |
|----------------------|-------------|----------------------|
| 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 - Friday, December 4, 2009

| | | |
|----------------------|---------------|----------------------|
| 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 - Monday, December 7, 2009

| | | |
|--------------------|---------------|----------------------|
| 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
FALL SEMESTER 2009**

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. Graduate Studies Web page <http://web.utk.edu/~gsinfo>.

REGISTRATION

UTSI students **MUST** register for the Fall semester 2009 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 March 9 – August 11, 2009. Late registration will be August 12 – August 28, 2009. Classes begin August 19, 2009.

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

Web address for Circle Park Online <https://cpo.utk.edu/CPOWeb/>

Days of the Week

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

FINANCIAL CALENDAR

| | |
|--|---------------------------------|
| Last registration day for receiving statements by mail | July 13, 2009 |
| Statement information available on CPO.utk.edu | August 3, 2009 |
| Priority registration, payment/confirmation deadline | August 11, 2009 (4:30 p.m. CST) |
| Late registration/late fees begin | August 12, 2009 |
| Late registration payment/confirmation deadline | August 28, 2009 (4:30 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) ext. 293 |
| Bookstore: | 1-888-822-UTSI (8874) ext. 204 |
| Business Office: | 1-888-822-UTSI (8874) ext. 204 |
| Registrar's Office: | 1-888-822-UTSI (8874) ext. 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 mee@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 using the URL <http://admissions.utk.edu/graduate/apply.shtml> [Click on APPLY ONLINE and Follow Directions] or send Application for Admission, transcripts, GRE scores (if required); and if international application, TOEFL scores to the Admission Office, E-109, Mail Stop 19, UTSI, Tullahoma, TN 37388-9700.

PAYMENT OF FEES

Payment of fees is due at time of registration. Late fees will begin on August 12, 2009. 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. | Dee Merriman | 931-393-7293 | dmerrima@utsi.edu |

TUITION AND/OR MAINTENANCE FEES*

Full-Time Fees For In-State Students (per semester)

| | |
|---------------------------------|-------------------|
| Maintenance Fee | \$3,413.00* |
| Programs and Services Fee | \$90.00 |
| Total | \$3,503.00 |

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

| | |
|---------------------------------|--------------------|
| Maintenance Fee | \$3,413.00* |
| Programs and Services Fee | \$90.00 |
| Tuition | \$6,898.00* |
| Total | \$10,401.00 |

***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 | \$ 380.00 per semester hour |
| 3 hrs. | \$ 1,140.00 |
| OUT-OF-STATE | \$ 1,147.00 per semester hour |
| 3 hrs. | \$ 3,441.00 |

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 may be divided into two equal payments payable on the 45th (October 2, 2009) 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 |
|-----------------------------------|--------------------|------------------|
| August 20 – August 24 | NO CHARGE | 100% |
| August 25 – August 30 | 20% CHARGE | 80% |
| August 31 – September 4 | 40% CHARGE | 60% |
| September 3 – September 9 | 60% CHARGE | 40% |
| September 10 – 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 D-100, 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, 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 <http://registrar.tennessee.edu/records/grades.shtml> 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) should be removed within one semester, excluding the Summer Term unless other arrangements have been made with the instructor. If the I is not removed within one calendar year, 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 Fall Semester 2009 must remove all INCOMPLETE GRADES by December 1, 2009.

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.

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 UTSI, are required to have comprehensive medical insurance. The policy for the 2009 - 2010 academic year will be announced in August 2009. The premium must be paid before registration. Contact the Human Resources Department (C-104 ext. 267) 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 FALL SEMESTER 2009

STUDY PERIOD...December 2, 2009

FINAL EXAMS.....December 3, 4, & 7, 2009

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, D-100.

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

SPECIAL ANNOUNCEMENT

THOMAS JEFFERSON LECTURE

September 22, 2009

3:00 P.M.

UTSI Auditorium

There will be **NO** scheduled classes at this time by request of
Dr. Stephen Corda, Interim UT Associate Vice President and Chief Operating Officer
Chairman and Associate Professor of Aviation Systems and Flight Research

Faculty will reschedule any afternoon classes tentatively scheduled for
September 22, 2009 between 2:30 – 3:45 p.m.

Contact the Registrar's Office
For available times and rooms for rescheduling

TO BE DETERMINED

TECHNICAL WRITING COURSE

**THIS IS A NON-CREDIT COURSE REQUIRED FOR ALL GRA's AT UTSI
AND OPTIONAL FOR ALL OTHER STUDENTS**

ENHANCE YOUR CAREER: Learn to efficiently tackle writing chores and to effectively communicate in writing. This course, designed for scientists and engineers, reviews the most important aspects of clear communication, with an emphasis on organization and coherence. The principles of logic, grammar, and style are considered as they apply to technical documents -- especially proposals, theses, and dissertations. Oral presentations and resumes will also be covered. Contact Dee Merriman at (931) 393-7293 or dmerrima@utsi.edu to enroll in the technical writing course.

INSTRUCTOR: Dr. Mary McLemore

TEXT: John M. Lannon; *Technical Communication*; 10th ed.; Longman;
ISBN# 0321270762

TIME: Tuesday 6:00 – 8:00

ROOM: E211

FEE: \$165.00 for non-GRA students

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

**THE UNIVERSITY OF TENNESSEE
SPACE INSTITUTE
FALL SEMESTER 2009 COURSE LISTINGS**

AEROSPACE ENGINEERING

AE 500 Master's Thesis (3, 6, 9)
SEC. 001 Moeller
006 Schulz
007 Vakili
008 Majdalani
009 Steinhoff
010 Flandro
011 Antar
012 Moulden
014 Corda

*AE 511 INVISCID FLOW (3) **CANCELLED**

SEC. 001 (Video Recorded)

TEXT: Karamcheti: Principles of Ideal Fluids Aerodynamics; R. E. Krieger Publ. Co.; ISBN# 0898741130.

TIME: Monday & Thursday 1:00 – 2:15 E111

PROFESSOR: Dr. Ahmad Vakili

Brief review of vector algebra, kinematics and dynamics of inviscid fluids; potential flow about body, conformal mapping review and application. *Prerequisite: AE 422 or ME 531, MATH 425 or equivalent.*

AS 515 AIR VEHICLE AERODYNAMICS AND PERFORMANCE (3)

SEC. 001 (Same as AS 503)

TEXT: Introduction to Flight; John D. Anderson; McGraw-Hill; Science/Engineering/Math; 6 Edition (October 25, 2007); ISBN # 978-0073529394.

TIME: Tuesday & Friday 1:00 – 2:30 E111

PROFESSOR: Dr. Peter Solies

AE 521 AERODYNAMICS OF COMPRESSIBLE FLUIDS (3)

SEC. 001

TEXT: Elements of Gasdynamics; Liepmann H.W., Roskho A.; Dover; ISBN# 0486 419 630.

TIME: Tuesday & Friday 9:15 – 10:30 B210

PROFESSOR: Dr. Trevor Moulden

Equations of compressible fluid motion. Thermodynamic component of the equation, forces on bodies in a moving fluid. One dimensional flows: nozzles. Heat and friction effects. Normal and oblique shock waves in supersonic flow.

***AE 525 HYPERSONIC FLOW (3) CANCELLED**
SEC. 003
TEXT: TBD
TIME: Monday & Thursday 10:45 – 12:00 E211
PROFESSOR: Dr. Gary Flandro

Slender body flow; similitude; Newtonian theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow. *Prerequisite(s): 512.*

***AE 527 AEROSPACE GROUND TEST FACILITIES (3) CANCELLED**
SEC. 001
TEXT: Instructor Lecture Notes and Short Course Notes.
TIME: Tuesday & Friday 9:15 – 10:30 E211
PROFESSOR: TBD

Atmospheric models and similarity considerations; aerodynamic test facilities; continuous and intermittent wind tunnels and ballistic ranges; propulsion test facilities or air breathing and rocket engines; space environment and space vehicle test facilities. *Prerequisite(s): 521, 541 and Mechanical Engineering 522.*

***AE 531 MAGNETOHYDRODYNAMICS (3) CANCELLED**
SEC. 001
TEXT: Foundations of Plasma Dynamics. This book is no longer in print, but copies of pertinent sections will be provided. E.H. Holt and R.E. Haskell, The Macmillan Co., 1965, 1st Ed., ISBN#: Library of Congress catalog card number: 65-14072.
TIME: Monday & Thursday 10:45 – 12:00 F252
PROFESSOR: Dr. Trevor Moeller

This course will also address the fundamentals of plasmas, where they are found, and their characteristics. Topics will include an introduction to electromagnetics, charged particle motion in static and uniform electric and magnetic fields, elastic collision processes, plasma kinetic theory, and charged particle interactions. The magnetohydrodynamic (MHD) approximation will also be introduced. Electromagnetic field theory; chemical kinetics; thermodynamic and thermophysical properties of gas plasmas; governing equations and applications. *Prerequisite(s): 422 and Mathematics 471.*

***AE 533 DYNAMICS (3) CANCELLED**
SEC. 002 (Same as ME 533/ES 533)
TEXT: TBD
TIME: Monday & Thursday 1:00 – 2:15 E211
PROFESSOR: TBD

Kinematics and dynamics of particles in three dimensions. Rotating coordinate systems. Hamilton's principle. Lagrange's equations of motion. Kinematics and dynamics of rigid bodies. (Same as Mechanical Engineering 533; Biomedical Engineering 534; Engineering Science 534). (DE) *Prerequisite(s): 391 or Mathematics 431 and an undergraduate vibrations course.*

***AE 539 CONTINUUM MECHANICS (3) CANCELLED**
SEC. 001 (Same as ES 539 & ME 539)
TEXT: TBD
TIME: Monday & Thursday 9:15 – 10:30 B112
PROFESSOR: Dr. Trevor 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. (*Same as Engineering Science 539; Biomedical Engineering 539; Mechanical Engineering 539*).

AE 541 FLUID MECHANICS I (3)
SEC. 001 (Same as ES 541 & ME 541)
TEXT: R.L. Panton: Incompressible Flow; Wiley Interscience; 3rd: ISBN# 047126122X.
TIME: Tuesday & Friday 9:15 – 10:30 E211
PROFESSOR: Dr. Basil Antar

Derivation of equations governing flow of inviscid and viscous fluids (conservation of mass, Newton's second law, conservation of energy). Equations of state and constitutive relations. Euler and Navier-Stokes forms and nondimensionalization. Exact solutions and introduction to potential and boundary-layer flows. (*Same as Engineering Science 541; Mechanical Engineering 541*). *Prerequisite: AE 511 or equivalent, or consent of instructor.*

*AE 562 FUNDAMENTALS OF AEROACOUSTICS (3) **CANCELLED**
SEC. 002
TIME: Tuesday & Friday 3:00 – 4:15 B210
TEXT: Class notes
PROFESSOR: Dr. Joseph Majdalani

Generation, propagation and absorption of sound in static and moving media. The purpose of this course is to provide a broad coverage of the fundamentals of the theory and measurement of acoustics and noise ranging from the production of sound from vibrations and waves, acoustical devices, aeroacoustics, sound in enclosed spaces, etc.

Please note that this course used to be AE561. After dropping it in 2007, it was reinstated by the Graduate Council effective Fall 2009. The announcement is attached:
<http://gradschool.utk.edu/GraduateCouncil/Minutes/GCMinutes10302008.pdf>

*AE 571 FINITE ELEMENTS FOR ENGINEERING APPLICATIONS (3) **CANCELLED**
SEC. 003 (Same as ES 551 & ME 561)
TEXT: Class Notes/Handouts
TIME: Tuesday & Friday 1:00 – 2:15 E210
PROFESSOR: TBD

Modern computational theory applied to conservation principles across the engineering sciences. Weak forms, extremization, boundary conditions, discrete implementation via finite element, finite difference, finite volume methods. Asymptotic error estimates, accuracy, convergence, stability. Linear problem applications in 1, 2 and 3 dimensions, extensions to non-linearity, non-smooth data, unsteady, spectral analysis techniques, coupled equation systems. Computer projects in heat transfer, structural mechanics, mechanical vibrations, fluid mechanics, heat/mass transport. (*Same as Biomedical Engineering 561; Mechanical Engineering 561; Engineering Science 551*). *Comment(s): Bachelor's degree in engineering or natural science required.*

AE 572 COMPUTATIONAL FLUID DYNAMICS (3)
SEC. 001 (Same as ES 552 & ME 562)
TEXT: TBD
TIME: Monday & Thursday 3:00 – 4:15 B210
PROFESSOR: Dr. John Steinhoff

Modern techniques in computing fluid dynamic flows will be covered. First, different classes of flows will be reviewed, and the most appropriate methods that satisfy both the physics requirements (capture the essential physics), and the engineering requirements (time required to set up and compute solutions) will be discussed. Methods suited for general configurations (blunt bodies) and methods suited for streamlined bodies, such as aircraft will be contrasted. The types of problems for which incompressible methods or compressible methods are best used, as well as those for which turbulence modeling is required will be covered. Accuracy issues and requirements will be covered, both for fully resolved flows and flows where turbulence modeling is needed. Particular equations to be covered include Potential, Euler, and (for laminar flow) Navier Stokes, as well as “Large Eddy Simulation” and “Reynolds Averaged Navier Stokes” for modeling turbulent flows. For compressible flows, methods involving shock capturing, with higher order schemes and limiters will be covered. For general flows, methods involving efficient treatment of concentrated vortices, passive scalar transport, as well as free surfaces will also be covered. (*Same as Engineering Science 552; Mechanical Engineering 562*).

AE 590 SELECTED ENGINEERING PROBLEMS (2-6)
 SEC. 001 PROFESSOR: Dr. Basil Antar

AE 595 SEMINAR: AEROSPACE AND MECHANICAL SYSTEMS (1)
 SEC. 001 (Same as ME 595& ES 595)
 PROFESSOR: Dr. Ahmad Vakili

AE 599 SPECIAL TOPICS: PARTICLE SIMULATIONS (3)
 SEC. 001 (Same as ME 599 Sec. 003/ES 581 Sec. 002)
 TIME: Tuesday & Friday 10:45 – 12:00 F252
 TEXT: Plasma Physics Via Computer Simulation; C.K. Birdsall and A.B. Langdon; Adam Hilger; 1st Edition; ISBN# 0-07-005371-5.
 PROFESSOR: Dr. Trevor Moeller

Computer simulation of plasmas comprises two general areas: Fluid and particle descriptions. Fluid description, typically suited to higher plasma densities, are solved using magnetohydrodynamic equations assuming approximate transport coefficients and can be solved using computational fluid dynamics techniques. Many plasmas, however, are of low enough density that the fluid description no longer applies. In these situations, particle simulations are used to simply compute the motions of a collection of charged particles, interacting with each other and applied external fields. This course will cover topics relevant to particle simulations, including particle in cell (PIC), Monte Carlo, particle weighting, particle movers, and field solvers. Students will gain experience with particle simulations through PIC software that is a companion to the text. In addition to those interested in plasmas, this course will be of interest to those interested in particle simulations as they apply in rarified gases.

*AE 599 SPECIAL TOPICS: RADIATION TRANSPORT (3) **CANCELLED**
 SEC. 002 (Same as ME 599 Sec. 004/ES 581 Sec. 003)
 TIME: Tuesday & Friday 10:45 – 12:00 F252
 TEXT: Thermal Radiation Heat Transfer; Robert Siegel and John R. Howell; Taylor and Francis; 4th Edition; ISBN# 1-56032-839-8.
 PROFESSOR: Dr. Trevor Moeller

Supplemental Text: Maher I. Boulos, Pierre Fauchais, and Emil Pfender, Thermal Plasmas: Fundamentals and Applications; Vol. 1; Plenum Press; ISBN # 0-306-44607-3.

This course will cover fundamental radiation processes that occur in absorbing, emitting, and radiating media (plasmas and high temperature gases). Topics will include: blackbody radiation concepts, fundamentals of radiation in matter, classical radiation, quantum theory of radiation,

line broadening, continuum radiation, equilibrium relations, and an introduction to spectral diagnostics of plasmas.

AE 600 DOCTORAL RESEARCH AND DISSERTATION (3, 6, 9)
SEC. 004 Schulz
005 Vakili
006 Majdalani
007 Steinhoff
008 Flandro
009 Antar
010 Corda

*AE 661 ADVANCED TOPICS IN COMPUTATIONAL FLUID DYNAMICS (3) **CANCELLED**
SEC. 001 (Same as ES 651 & ME 651)
TEXT: TBD
TIME: Monday & Thursday 2:30 – 3:45 E210
PROFESSOR: TBD

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*). *Prerequisite(s): 552.*

AE 681 ADVANCED VISCOUS FLOW (3)
SEC. 001
TEXT: Class Notes
TIME: Tuesday & Friday 2:30 – 3:45 B112
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. Applications of group theory. Special problem areas of interest to students. *Prerequisite(s): 512, Continuum Mechanics and Mathematics 562.*

AVIATION SYSTEMS

AS 500 MASTER'S THESIS (3, 6, or 9)
SEC. 001 Corda
002 Solies
003 Collins
004 Ranaudo
005 Muratore
006 Pujol

AS 502 REGISTRATION USE OF FACILITIES (1 –15)
SEC. 001 Corda
002 Solies
003 Collins
004 Ranaudo
005 Muratore
006 Pujol

AS 503 AIR VEHICLES (3)
 SEC. 001 (Video Recorded) (Same as AE 515)
 TEXT: 1. Asselin, Mario, An Introduction to Aircraft Performance; AIAA Education Series, Reston, VA, 1997
 2. Kinney, Jeremy R., Airplanes – The Life Story of a Technology, John Hopkins University Press, Baltimore, MD, 2008
 TIME: Tuesday & Friday 1:00 – 2:30 E111
 PROFESSOR: Dr. Peter Solies

AS 508 FLIGHT TEST INSTRUMENTATION (3)
 SEC. 001 (Video Recorded)
 TEXT: TBD
 TIME: Monday & Thursday 1:30 – 2:45 E113
 PROFESSOR: John Muratore

Principles of measurement, measuring devices with views toward both ground and flight aerospace testing: measurement fundamentals, sensors for specific parameters (e.g. temperature, heat flux, flow rate, pressure, acceleration, vibration, strain, and humidity), data bus integration, signal condition, telemetry, and fabrication.

COMMENT: The objective of this course is to familiarize the student with the principles of flight test instrumentation sufficient to allow the student to plan and instrument an aircraft to conduct a series of tests. Subjects to be covered include basic principles of measurement theory, components of an instrumentation system, specific sensors used for flight test and the signal conditioning required to deal with typical flight test sensors. The class will also cover interfacing and data acquisition with digital sensors that output their results in computer compatible format such as serial data streams. The class will make extensive use of LabVIEW to experiment with sensors and instruments in the laboratory experiments.

This class will be videotaped is being offered for the first time to DISTANCE Students. All Distance students will be required to purchase a NI USB-6008 Student Kit with LabVIEW student edition from National Instruments (approximate cost \$170.00) in order to perform required laboratory assignments.

AS 510 SPECIAL TOPICS IN AVIATION SYSTEMS: INTRODUCTION TO AVIONICS I (3)
 SEC 001 (Video Recorded)
 TEXT: Avionics Training: Systems, Installation and Troubleshooting; Len Buckwalter; Avionics Communications, Inc.; Latest Ed.; ISBN# 1-88-5544-21-9.
 TIME: Tuesday & Friday 10:30 – 11:45 E113
 PROFESSOR: Dr. Alfonso Pujol, Jr.

Avionic systems and communications, including analog and digital systems, aviation bands and frequencies, satellite and aircraft communications, selective calling, emergency locator transmitter, omni-directional range, instrument and microwave landing systems, automatic direction finder, and other topics are also discussed.

AS 515 AVIATION HUMAN FACTORS (3)
 SEC 001 (Interactive from UTK)
 TEXT: Human Factors in Aviation; Earl L. Wiener and David C. Nagel; ISBN# 0-12-750031-6.
 TIME: Tuesday & Thursday 10:15 – 11:30 E111
 PROFESSOR: Professor Richard Ranaudo

Human factors pertinent to aviation: concept of human factors, human error, fatigue, body rhythms, performances, motivation, vision and visual illusions, communication, attitudes, training devices, displays and controls, crew systems integration, system safety, workload, Human Factors evaluation methods. Applications to various aviation operations.

AS 522 EXPERIMENTAL FLIGHT MECHANICS: FIXED WING STABILITY AND CONTROL (3)

SEC. 001

TEXT: Ralph D. Kimberlin: Flight Testing of Fixed Wing Aircraft; AIAA Education Series; ISBN# 1-56347-564-2.

TIME: Tuesday & Friday 8:00 – 9:15 Airport Classroom

PROFESSOR: Dr. Stephen Corda

This course will cover fundamental theories, flight test techniques, and data collection and analyses for fixed wing aircraft stability and control. Topics will include static and dynamic longitudinal stability, longitudinal maneuvering stability and control, static and dynamic lateral-directional stability, lateral control power, and departure testing. 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 521 Fixed Wing Performance or consent of instructor.*

AS 550 PROJECT AVIATION SYSTEMS (3)

SEC. 001 Corda

002 Solies

003 Collins

004 Ranaudo

005 Muratore

006 Pujol

007 Martos

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

COMPUTER SCIENCE

CS 471 NUMERICAL ANALYSIS (3)

SEC. 001 (Video Recorded) (Same as Math 471)

TEXT: TBD

TIME: Monday & Wednesday 2:30 – 3:45 E111

PROFESSOR: Dr. Trevor Moulden

Numerical computation, instabilities, and rounding. Interpolation and approximation by polynomials and piecewise polynomials. Quadrature and numerical solution of initial and boundary value problems of ordinary differential equations, stiff systems. *Prerequisite: Numerical Algorithms I or consent of instructor.*

*CS 594 INTRODUCTION TO COMPUTER SCIENCE FOR COMPUTATIONAL SCIENTISTS (3) **CANCELLED**

SEC. 007 (Interactive Video from UTSI)

TEXT: C Pocket Reference; Peter Prinz and Ulla Kirch-Prinz; O'Reilly, 2002; Current Edition; ISBN #: ISBN-10: 0596004362; ISBN-13: 978-0596004361.

TIME: Wednesday 4:00 – 6:35 E111

PROFESSOR: Dr. Bruce Whitehead

Students in any field are welcome in this course, whether or not you're interested in the Interdisciplinary Graduate Minor in Computational Science (IGMCS). Topics include basic data structures, effective compiler toolchain use, Fortran/C interoperability, concurrency, parallel computing models & application programming interfaces (APIs), and cluster computing. Readings on each of these topics (available on the web) will supplement the textbook. Evaluation will be based primarily on 5 programming assignments spaced at intervals of 2-3 weeks throughout the semester. *Prerequisite: Either the C or Fortran programming language, but not necessarily both. We will learn enough C in this course to enable you to do the programming assignments in C if you want to learn how to program in that language. However, you have the choice of doing each assignment in either C or Fortran, in case you already know Fortran and are more comfortable using it.*

In this course, we will use the gcc and gfortran (C and Fortran) compilers that are free, high quality, open source, and widely used. Instructions will be provided in the course for installing these compilers on Windows (XP or Vista) systems, as a part of the Cygwin software suite freely available over the Internet. (Linux users are also welcome, but prior knowledge of Linux or Unix is not necessary for this course.) Although taught over interactive video, this course will be hands-on to the greatest extent possible. The topics in this course are learned best by doing, not just by listening to a lecture. If you own a laptop, you are strongly encouraged to bring it with you to each class meeting, so that you can tinker with and run example programs as we discuss them in class. (You are encouraged to do the same if you view a class meeting off-line.)

For further information about this course (or about the IGMCS program), please contact Dr. Whitehead at bwhitehe@utsi.edu or 931-393-7296.

ELECTRICAL and COMPUTER ENGINEERING

ECE 500 MASTER'S THESIS (3, 6, or 9)
 SEC. 001 Bomar
 023 Smith
 024 Whitehead
 025 Pujol

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

ECE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)
 SEC. 002 (Video Recorded) (Same as IE/MSE/ME 529)

TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Taylor and Francis Group, 2009; ISBN-13: 978-1-4200-9524-4 (Hardcover); ISBN-10: 1420095234; List Price: \$99.95.

TIME: Monday & Thursday 9:45 – 11:00 E113

PROFESSOR: Dr. Monty Smith

Fundamental concepts of linear algebra to problems in engineering systems: steady state and dynamic systems. Geometric and physical interpretations of relevant concepts: least square problems. LU, QR, and SVD decompositions of system matrix, eigenvalue problems, and similarity transformations in solving difference and differential equations; numerical stability aspects of various algorithms; application of linear algebra concepts in control and optimization

studies; introduction to linear programming. Computer projects. (Same as Biomedical Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529). Comment(s): Graduate standing or consent of instructor required.

Comments: Methods of linear algebra as applied to engineering. Topics to be covered include: systems of linear equations, matrices, solutions of linear equations, Gaussian elimination, vector spaces, linear transformations, orthogonality, least-squares approximations, determinants, eigenvalues and eigenvectors, positive definite matrices, singular value decomposition, and numerical computational methods. Course assignments will consist of pencil-and-paper exercises and numerical exercises involving MATLAB. Students registering for this course are assumed to have access to at least the Student Edition of MATLAB.

*ECE 553 Computer Networks (3) **CANCELLED**
SEC. 001

TEXT: TCP/IP Protocol Suite; Behrouz A. Forouzan; McGraw Hill; Fourth Edition;
ISBN #: 0-07-296772-2.

TIME: Tuesday & Friday 9:15 – 10:30 F252

PROFESSOR: Dr. Bruce Bomar

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. Other topics include ad-hoc networking, network security and network simulation.

ECE 600 DOCTORAL RESEARCH AND DISSERTATION (3-15)
SEC. 021

PROFESSOR: Dr. Bruce Bomar

Repeatability: May be repeated.

ENGINEERING SCIENCE

ES 500 MASTER'S THESIS (1 - 15)

SEC. 001 Moeller

009 Schulz

010 Vakili

011 Majdalani

012 Steinhoff

013 Flandro

014 Antar

*ES 533 DYNAMICS (3) **CANCELLED**

SEC. 002 (Same as AE 533/ME 533)

TEXT: TBD

TIME: Monday & Thursday 1:00 – 2:15 E211

PROFESSOR: TBD

Kinematics and dynamics of particles in three dimensions. Rotating coordinate systems. Hamilton's principle. Lagrange's equations of motion. Kinematics and dynamics of rigid bodies. (Same as Mechanical Engineering 533; Biomedical Engineering 534; Engineering Science 534). (DE) Prerequisite(s): 391 or Mathematics 431 and an undergraduate vibrations course.

*ES 539 CONTINUUM MECHANICS (3) **CANCELLED**
 SEC. 001 (Same as AE 539 & ME 539)
 TEXT: TBD
 TIME: Monday & Thursday 9:15 – 10:30 B112
 PROFESSOR: Dr. Trevor 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. (*Same as Aerospace Engineering 539; Biomedical Engineering 539; Mechanical Engineering 539*).

ES 541 FLUID DYNAMICS I (3)
 SEC. 001 (Same as AE 541 & ME 541)
 TEXT: R.L. Panton: Incompressible Flow; Wiley Interscience; 3rd: ISBN# 047126122X.
 TIME: Tuesday & Friday 9:15 – 10:30 E211
 PROFESSOR: Dr. Basil Antar

Derivation of equations governing flow of inviscid and viscous fluids (conservation of mass, Newton's second law, conservation of energy). Equations of state and constitutive relations. Euler and Navier-Stokes forms and nondimensionalization. Exact solutions and introduction to potential and boundary-layer flows. (*Same as Aerospace Engineering 541; Mechanical Engineering 541*). *Prerequisite: AE 511 or equivalent, or consent of instructor.*

*ES 551 FINITE ELEMENTS FOR ENGINEERING APPLICATIONS (3) **CANCELLED**
 SEC. 003 (Same as AE 571 & ME 561)
 TEXT: Class Notes/Handouts
 TIME: Tuesday & Friday 1:00 – 2:15 E210
 PROFESSOR: TBD

Modern computational theory applied to conservation principles across the engineering sciences. Weak forms, extremization, boundary conditions, discrete implementation via finite element, finite difference, finite volume methods. Asymptotic error estimates, accuracy, convergence, stability. Linear problem applications in 1, 2 and 3 dimensions, extensions to non-linearity, non-smooth data, unsteady, spectral analysis techniques, coupled equation systems. Computer projects in heat transfer, structural mechanics, mechanical vibrations, fluid mechanics, heat/mass transport. (*Same as Aerospace Engineering 571; Biomedical Engineering 561; Mechanical Engineering 561*). *Comment(s): Bachelor's degree in engineering or natural science required.*

ES 552 COMPUTATIONAL FLUID DYNAMICS (3)
 SEC. 001 (Same as AE 572 & ME 562)
 TEXT: Monday & Thursday 3:00 – 4:15 B210
 TIME: TBD
 PROFESSOR: Dr. John Steinhoff

Modern techniques in computing fluid dynamic flows will be covered. First, different classes of flows will be reviewed, and the most appropriate methods that satisfy both the physics requirements (capture the essential physics), and the engineering requirements (time required to set up and compute solutions) will be discussed. Methods suited for general configurations (blunt bodies) and methods suited for streamlined bodies, such as aircraft will be contrasted. The types of problems for which incompressible methods or compressible methods are best used, as well as those for which turbulence modeling is required will be covered. Accuracy issues and requirements will be covered, both for fully resolved flows and flows where turbulence modeling is needed. Particular equations to be covered include Potential, Euler, and (for laminar flow) Navier Stokes, as well as "Large Eddy Simulation" and "Reynolds Averaged Navier Stokes" for

modeling turbulent flows. For compressible flows, methods involving shock capturing, with higher order schemes and limiters will be covered. For general flows, methods involving efficient treatment of concentrated vortices, passive scalar transport, as well as free surfaces will also be covered. (*Same as Aerospace Engineering 572; Mechanical Engineering 562*).

ES 581 SPECIAL TOPICS: PARTICLE SIMULATIONS (3)
SEC. 002 (Same as ME 599 Sec. 003/AE 599 Sec. 001)
TIME: Monday & Thursday 10:45 – 12:00 F252
TEXT: Plasma Physics Via Computer Simulation; C.K. Birdsall and A.B. Langdon; Adam Hilger; 1st Edition; ISBN# 0-07-005371-5.
PROFESSOR: Dr. Trevor Moeller

Computer simulation of plasmas comprises two general areas: Fluid and particle descriptions. Fluid description, typically suited to higher plasma densities, are solved using magnetohydrodynamic equations assuming approximate transport coefficients and can be solved using computational fluid dynamics techniques. Many plasmas, however, are of low enough density that the fluid description no longer applies. In these situations, particle simulations are used to simply compute the motions of a collection of charged particles, interacting with each other and applied external fields. This course will cover topics relevant to particle simulations, including particle in cell (PIC), Monte Carlo, particle weighting, particle movers, and field solvers. Students will gain experience with particle simulations through PIC software that is a companion to the text. In addition to those interested in plasmas, this course will be of interest to those interested in particle simulations as they apply in rarified gases.

*ES 581 SPECIAL TOPICS: RADIATION TRANSPORT (3) **CANCELLED**
SEC. 003 (Same as AE 599 Sec. 002/ME 599 Sec. 004)
TIME: Tuesday & Friday 10:45 – 12:00 F252
TEXT: Thermal Radiation Heat Transfer; Robert Siegel and John R. Howell; Taylor and Francis; 4th Edition; ISBN# 1-56032-839-8.
PROFESSOR: Dr. Trevor Moeller

Supplemental Text: Maher I. Boulos, Pierre Fauchais, and Emil Pfender, Thermal Plasmas: Fundamentals and Applications; Vol. 1; Plenum Press; ISBN # 0-306-44607-3.

This course will cover fundamental radiation processes that occur in absorbing, emitting, and radiating media (plasmas and high temperature gases). Topics will include: blackbody radiation concepts, fundamentals of radiation in matter, classical radiation, quantum theory of radiation, line broadening, continuum radiation, equilibrium relations, and an introduction to spectral diagnostics of plasmas.

ES 581 SPECIAL TOPICS: MATHEMATICAL TREATMENT OF WAVES (3)
SEC. 004
TIME: TBD
TEXT: TBD
PROFESSOR: Dr. John Steinhoff

Mechanics problems related to recent developments. *Repeatability: May be repeated. Maximum 6 hours. Registration Permission: Consent of Instructor.*

ES 595 SEMINAR: COMPUTATIONAL MECHANICS (1)
SEC. 001 PROFESSOR: Dr. Ahmad Vakili

ES 600 DOCTORAL AND RESEARCH DISSERTATION (3, 6, 9)
 SEC. 005 Schulz
 006 Vakili
 007 Majdalani
 008 Steinhoff
 009 Flandro
 010 Antar

*ES 651 ADVANCED TOPICS IN COMPUTATIONAL FLUID DYNAMICS (3) **CANCELLED**
 SEC. 001 (Same as AE 661 & ME 651)
 TEXT: TBD
 TIME: Monday & Thursday 2:30 – 3:45 E210
 PROFESSOR: TBD

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*). Prerequisite(s): 552.

ENGINEERING MANAGEMENT

EM 501 CAPSTONE PROJECT (3-6)
 SEC. 001 UTSI students participating at Tullahoma or Oak Ridge
 SEC. 002 UTSI students participating elsewhere
 PROFESSOR: Drs. Gregory Sedrick and Denise Jackson

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 FOR EM STUDENTS (1-15)
 SEC. 001 Students located at Tullahoma or Oak Ridge
 SEC. 002 Students not located at Tullahoma or Oak Ridge
 PROFESSOR: Drs. Gregory Sedrick and Denise Jackson

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 532 PRODUCTIVITY AND QUALITY ENGINEERING (3)
 SEC. 001 UTSI students participating at Tullahoma or Oak Ridge
 SEC. 002 UTSI students participating elsewhere
 SEC. 003 UTK students participating at Knoxville DE classrooms
 SEC. 004 UTK students participating elsewhere
 TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm
 TIME: Tuesday 4:00 – 6:35 E113
 PROFESSOR: Dr. Denise Jackson

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.

EM 533 THEORY AND PRACTICE OF ENGINEERING MANAGEMENT (3)
SEC. 001 UTSI students participating at Tullahoma and Oak Ridge
SEC. 002 UTSI students participating elsewhere
SEC. 003 UTK students participating at Knoxville DE classrooms
SEC. 004 UTK students participating elsewhere
TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm
TIME: Monday 4:00 – 6:35 E113
PROFESSOR: Dr. Gregory Sedrick

Principles of engineering management, including: business and organization design, culture, leadership, marketing and competition in global economy, motivation and performance management, empowerment, organizational behavior, and diversity. Systems thinking, learning organizations, and systems dynamics modeling. Principle application to work settings and case studies.

EM 537 ANALYTICAL METHODS FOR ENGINEERING MANAGERS (3)
SEC. 001 UTSI students participating at Tullahoma or Oak Ridge
SEC. 002 UTSI students participating elsewhere
SEC. 003 UTK students participating at Knoxville DE classrooms
SEC. 004 UTK students participating elsewhere
TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm
TIME: Wednesday 1:00 – 3:30 E113
PROFESSOR: Dr. George Garrison

Survey of management analysis and control systems through IE 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. Not for credit for students with undergraduate degrees in industrial engineering.

EM 539 STRATEGIC MANAGEMENT IN TECHNICAL ORGANIZATIONS (3)
SEC. 001 UTSI students participating at Tullahoma or Oak Ridge
SEC. 002 UTSI students participating elsewhere
SEC. 003 UTK students participating at Knoxville DE classrooms
5SEC. 004 UTK students participating elsewhere
TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm
TIME: Thursday 4:00 – 6:35 E113
PROFESSOR: Dr. Gregory Sedrick

Strategic planning process and strategic management in practice, corporate vision and mission; product, market, organizational, and financial strategies; external factors; commercialization of new analysis to determine commercial feasibility of new ventures. *Prerequisite(s): EM 534 and IE 518 or consent of instructor.*

EM 595 SPECIAL TOPICS IN ENGINEERING MANAGEMENT (3)
SEC. 001
PROFESSOR: Dr. Denise Jackson

INDUSTRIAL ENGINEERING

IE 500 MASTER'S THESIS (1-15)
SEC. 005 Dr. Denise Jackson as main advisor
SEC. 006 Dr. Gregory Sedrick as main advisor

IE 515 ADVANCED PRODUCTION AND INVENTORY SYSTEMS (3)
(CENTRA Web-based Course from UTK)
SEC. 003 UTSI students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI students participating elsewhere
TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm
TIME: Thursday 12:40 – 1:55 (EST)
PROFESSOR: Dr. Xiaoyan Zhu

Advanced topics in production planning and inventory systems. Material requirements planning; production planning and master scheduling; just-in-time concepts; distribution requirements planning; and other selected topics. *Prerequisite: 402 or consent of instructor.*

IE 516 STATISTICAL METHODS IN INDUSTRIAL ENGINEERING (3)
SEC. 003 UTSI students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI students participating elsewhere
TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm
TIME: Wednesday 4:00 – 6:35 E113
PROFESSOR: Dr. K. C. Reddy

Application of classical statistical techniques to industrial engineering problems. Statistics and statistical thinking in managerial context of organizational improvement; descriptive statistics and distribution theory; relationship between statistical process control techniques and classical statistical tools; parameter estimation and hypothesis testing; goodness-of-fit testing; linear regression and correlation; analysis of variance; single and multiple factor experimental design. *Prerequisite: Probability and Statistics for Scientists and Engineers, or equivalent.*

IE 526 ADVANCED APPLICATIONS OF SYSTEMS MODELING AND
SIMULATION (3)
(CENTRA Web-based Course from UTK)
SEC. 003 UTSI students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI students participating elsewhere
TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm
TIME: Thursday 2:10 – 3:25
PROFESSOR: Dr. Xueping Li

Modeling of discrete, continuous, and combined systems using current simulation software. Development of flexible simulation models to enhance accessibility of simulation models for experimentation. Development of distributed simulation models to represent and test production and supply chain systems. (*Same as Management Science 526*). *Prerequisite(s): 306 or 525.*

IE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)
SEC. 002 (Video Recorded) (Same as ECE/MSE/ME 529)
TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Taylor and Francis Group, 2009; ISBN-13: 978-1-4200-9524-4 (Hardcover); ISBN-10: 1420095234; List Price: \$99.95.
TIME: Monday & Thursday 9:45 – 11:00 E113
PROFESSOR: Dr. Monty Smith

Fundamental concepts of linear algebra to problems in engineering systems: steady state and dynamic systems. Geometric and physical interpretations of relevant concepts: least square problems. LU, QR, and SVD decompositions of system matrix, eigenvalue problems, and similarity transformations in solving difference and differential equations; numerical stability aspects of various algorithms; application of linear algebra concepts in control and optimization studies; introduction to linear programming. Computer projects. (*Same as Biomedical Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529*). *Comment(s): Graduate standing or consent of instructor required.*

Comments: Methods of linear algebra as applied to engineering. Topics to be covered include: systems of linear equations, matrices, solutions of linear equations, Gaussian elimination, vector spaces, linear transformations, orthogonality, least-squares approximations, determinants, eigenvalues and eigenvectors, positive definite matrices, singular value decomposition, and numerical computational methods. Course assignments will consist of pencil-and-paper exercises and numerical exercises involving MATLAB. Students registering for this course are assumed to have access to at least the Student Edition of MATLAB.

IE 600 DOCTORAL RESEARCH/DISSERATION (3-15)
 SEC. 003 Dr. Denise Jackson
 SEC. 007 Dr. Gregory Sedrick

MATERIAL SCIENCE & ENGINEERING

MSE 500 MASTER'S THESIS (3, 6, 9)
 SEC. 002 PROFESSOR: Dr. William Hofmeister

MSE 503 GRADUATE SEMINAR IN MATERIALS SCIENCE AND ENGINEERING
 (1)
 SEC. 002 (Same as Phys 503)
 TEXT: No text required for this course
 TIME: Monday & Thursday 2:30 – 3:45 F252
 PROFESSOR: Dr. Lloyd Davis

Admission to graduate program required.

MSE 511 FUNDAMENTALS OF MATERIALS SCIENCE AND ENGINEERING I (3)
 SEC. 002
 TITLE: TBD
 TIME: Tuesday & Friday 2:30 – 3:45 F252
 PROFESSOR: Drs. William Hofmeister and George Murray

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

MSE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)
 SEC. 002 (Video Recorded) (Same as IE/ECE/ME 529)
 TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Taylor and Francis Group, 2009; ISBN-13: 978-1-4200-9524-4 (Hardcover); ISBN-10: 1420095234; List Price: \$99.95.
 TIME: Monday & Thursday 9:45 – 11:00 E113
 PROFESSOR: Dr. Monty Smith

Fundamental concepts of linear algebra to problems in engineering systems: steady state and dynamic systems. Geometric and physical interpretations of relevant concepts: least square problems. LU, QR, and SVD decompositions of system matrix, eigenvalue problems, and similarity transformations in solving difference and differential equations; numerical stability aspects of various algorithms; application of linear algebra concepts in control and optimization studies; introduction to linear programming. Computer projects. (*Same as Biomedical Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529*). *Comment(s): Graduate standing or consent of instructor required.*

Comments: Methods of linear algebra as applied to engineering. Topics to be covered include: systems of linear equations, matrices, solutions of linear equations, Gaussian elimination, vector spaces, linear transformations, orthogonality, least-squares approximations, determinants, eigenvalues and eigenvectors, positive definite matrices, singular value decomposition, and numerical computational methods. Course assignments will consist of pencil-and-paper exercises and numerical exercises involving MATLAB. Students registering for this course are assumed to have access to at least the Student Edition of MATLAB.

MSE 552 LAB METHODS IN POLYMER ENGINEERING: FIBER SCIENCE (3)
SEC. 003
TEXT: TBD
TIME: Monday & Thursday 1:00 – 2:15 F 253
PROFESSOR: Dr. Zhongren Yue

Physical properties, mechanical properties and microstructure of polymeric fibers; relation to end-use properties.

COMMENT: Synthesis, structure, and properties of high performance carbon fibers, carbon nanofibers and nanotube as well as synthetic polymer fibers and inorganic fibers. Characterization techniques for carbon, polymeric, and inorganic fibers. Physical properties, mechanical properties and microstructure of these fibers; relation to end-use properties. Introduction of high performance fiber-reinforced composite materials, their fabrication, structure, properties, and applications.

MSE 600 DOCTORAL RESEARCH AND DISSERTATION (3, 6, 9)
SEC. 002 PROFESSOR: Dr. William Hofmeister
SEC. 003 PROFESSOR: Dr. Jackie Johnson

MSE 676 SPECIAL TOPICS IN MATERIALS SCIENCE AND ENGINEERING: "ALL THINGS CARBON" (3)
SEC. 006
TEXT: No Central Text
TIME: Tuesday & Friday 10:00 – 11:15 CLA Conference Room
PROFESSOR: Dr. Jackie Johnson (lead); Dr. William Hofmeister; Dr. Charles Johnson; Dr. George Murray; Dr. Zhongren Yue

This course will focus on the structure and mechanical, electronic and optical properties of carbon. Grades will be assigned on the basis of two exams, a mid-term and a final, a written assignment, a class presentation, and participation in class discussions, each to be weighed equally. Homework problems will be assigned but will not be graded. The answers to the problems in each assignment will be discussed at the following lecture. The topic of the paper will be the critical review of an article in a materials journal selected by the student and approved by the instructors. Each student is encouraged to pick a topic of personal interest or significance. The class presentation will involve choosing a topic from the list below, finding relevant

materials for a thirty minute presentation of the topic (probably based on a review article in a journal, or based on a book chapter), and leading a class discussion of the topic as well as answering questions.

LIST OF SUGGESTED PRESENTATION TOPICS: Diamond films, Diamond-like carbon films, Carbon fibers, Carbon Nanotubes, Fullerenes, Other topic approved by the Instructor.

MATHEMATICS

MATH 404 APPLIED VECTOR CALCULUS (3)

SEC. 001

TEXT: Wilfred Kaplan: Advanced Calculus; 5th ed.; Addison Wesley; ISBN# 0-201-79937-5.

TIME: Monday & Thursday 1:00 – 2:15 E111

PROFESSOR: Dr. Kenneth Kimble

Refresher of one-variable calculus; function of several variables; partial derivatives; Vectors and vector fields; curves and surfaces; multiple, line, and surface integrals. Green and Stokes' theorems.

*MATH 435 PARTIAL DIFFERENTIAL EQUATIONS (3)

SEC. 002

TEXT: G. Strang: Linear Algebra and It's Applications; 4th Ed.; Brooks and Cole; ISBN-10 0030105676; ISBN-13 978-0030105678.

TIME: Tuesday & Friday 10:45 – 12:00 B210

PROFESSOR: Dr. Kenneth Kimble

MATH 471 NUMERICAL ANALYSIS (3)

SEC. 001 (Video Recorded at UTSI)

SEC. 003 (AEDC)

TEXT: Numerical Analysis; Borden R.L., Faires, J.P.; Thompson Brooks/Cole; 8th edition; ISBN# 0 534 39 200 8.

TIME: Monday & Wednesday 2:30 – 3:45 E111

PROFESSOR: Dr. Trevor Moulden (UTSI students only)

TBD (AEDC on-base students only – time and place TBD)

Numerical computation, instabilities, and rounding. Interpolation and approximation by polynomials and piecewise polynomials. Quadrature and numerical solution of initial and boundary value problems of ordinary differential equations, stiff systems. *Prerequisite: Numerical Algorithms I or consent of instructor.*

MATH 500 MASTER'S THESIS (3, 6, or 9)

SEC. 001 PROFESSOR: Dr. Boris Kupersmidt

MATH 517 MATHEMATICAL METHODS IN PHYSICS I (3)

SEC. 002 (Same as Phys 571)

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

TEXT: Mathematical Methods for Physicists; George Arfken and Hans Weber; Elsevier; 6th Edition (2005); ISBN #: 0-12-059876-0.

PROFESSOR: Dr. Christian Parigger

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.

(Same as Physics 571.) *Recommended Background: Advanced calculus and differential equations.*

The course syllabus (lecture series and exercises) is designed to be attractive for pure and applied Science students. References to classical books such as “Methods of Mathematical Physics Vol I and II” by Courant & Hilbert will be made over and above references to classical Physics problems usually found in “Classical Mechanics,” “Electrodynamics,” “Quantum Mechanics,” “Statistical Mechanics,” or “Solid State Physics.” This course is followed in spring 2010 by the PHYS573 “Numerical Methods in Physics.” Also, while PHYS571 is cross-referenced as the same as MATH517, this course qualifies as a Physics portion for students seeking the so-called “Interdisciplinary Graduate Minor in Computer Science.” For Fall 2009 and Spring 2010, UT’s electronic “blackboard” will be used.

MATH 519 SEMINAR IN APPLIED MATHEMATICS (1-3)
SEC. 002
TEXT: Notes provided by Instructor
TIME: Monday & Thursday 1:00 – 2:15 B210
PROFESSOR: Dr. Boris Kupershmidt

Repeatability: May be repeated. Maximum 12 hours.

*MATH 585 OPTIMAL CONTROL THEORY (3) **CANCELLED**
SEC. 002
TEXT: TBD
TIME: Monday & Thursday 1:00 – 2:15 B112
PROFESSOR: Dr. Kenneth Kimble

Deterministic optimal control. Examples involving calculus of variations, optimal trajectories, and engineering control problems. Introduction to stochastic control. *Recommended Background: One year of advanced calculus and undergraduate differential equations.*

MATH 593 INDEPENDENT STUDY (1-12)
SEC. 002
PROFESSOR: Dr. Boris Kupershmidt

Repeatability: May be repeated. Maximum 12 hours.

MECHANICAL ENGINEERING

ME 500 MASTER THESIS (3)
SEC. 001 Moeller
021 Schulz
022 Vakili
023 Majdalani
024 Steinhoff
025 Flandro
026 Antar

ME 511 HEAT TRANSFER I (3)
SEC. 001 (Interactive Video)
TEXT: G. E. Meyers: Analytical Methods in Conduction Heat Transfer; Amcht Publishing; ISBN# 0966606507.
TIME: Tuesday & Friday 1:00 – 2:15 E113

PROFESSOR: Dr. Basil Antar

Thermal physical properties of material. Analysis of steady-state and time dependent heat conduction by analytical methods. Numerical solution of heat conduction equation.

*ME 515 NUMERICAL HEAT AND MASS TRANSFER (3) **CANCELLED**

SEC. 001

TEXT: TBD

TIME: Monday & Thursday 7:45 – 9:00 E211

PROFESSOR: TBD

Discrete modeling of Navier-Stokes equations and energy equation via control volume methods. Difference methods for discretization of convective term, iterative solution algorithms for pressure-linked equations modeling forced and buoyancy driven flows. Computer project. *Recommended Background: Undergraduate fluid mechanics and heat transfer course.*

ME 521 THERMODYNAMICS I (3)

SEC. 001

TEXT: Thermodynamics, and Engineering Approach; Y. Cengel and M. Boles; Half.com_Books_Thermodynamics_An_Engineering_Approach.webarchive; Amazon.com_Thermodynamics_An_Engineering_Approach_w_version_1.2_CD_ROM_Yunus A. Cengel, Michael Boles_Books.webarchive.

TIME: Wednesday & Friday 8:30 – 9:45 E113

PROFESSOR: Dr. Robert W. McAmis

Macroscopic thermodynamics, including First and Second Law analyses and applications, availability, phase and chemical equilibrium, combustion, gas and liquid mixtures, property relations, determination of thermodynamic properties from molecular structure and spectroscopic data.

*ME 525 COMBUSTION AND CHEMICALLY REACTING FLOWS (3) **CANCELLED**

SEC: 001

TEXT: TBD

TIME: Monday & Thursday 7:45 – 9:00 E210

PROFESSOR: Dr. Gary Flandro

Fundamentals: thermochemistry, chemical kinetics and conservation equations; phenomenological approach to laminar flames; diffusion and premixed flame theory; single droplet combustion; deflagration and detonation theory; stabilization of combustion waves in laminar streams; flammability limits of premixed laminar flames; introduction to turbulent flames. *Prerequisite(s): 522 and 541 or consent of instructor.*

ME 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)

SEC. 002 (Video Recorded) (Same as IE/MSE/ECE 529)

TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Taylor and Francis Group, 2009; ISBN-13: 978-1-4200-9524-4 (Hardcover); ISBN-10: 1420095234; List Price: \$99.95.

TIME: Monday & Thursday 9:45 – 11:00 E113

PROFESSOR: Dr. Monty Smith

Fundamental concepts of linear algebra to problems in engineering systems: steady state and dynamic systems. Geometric and physical interpretations of relevant concepts: least square problems. LU, QR, and SVD decompositions of system matrix, eigenvalue problems, and

similarity transformations in solving difference and differential equations; numerical stability aspects of various algorithms; application of linear algebra concepts in control and optimization studies; introduction to linear programming. Computer projects. (*Same as Biomedical Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529*). *Comment(s): Graduate standing or consent of instructor required.*

Comments: Methods of linear algebra as applied to engineering. Topics to be covered include: systems of linear equations, matrices, solutions of linear equations, Gaussian elimination, vector spaces, linear transformations, orthogonality, least-squares approximations, determinants, eigenvalues and eigenvectors, positive definite matrices, singular value decomposition, and numerical computational methods. Course assignments will consist of pencil-and-paper exercises and numerical exercises involving MATLAB. Students registering for this course are assumed to have access to at least the Student Edition of MATLAB.

*ME 533 DYNAMICS (3) **CANCELLED**
SEC. 002 (Same as AE533/ES533)
TEXT: Goldstein, H.; Classical Mechanics; 3rd Ed.; McMillan.
TIME: Monday & Thursday 1:00 – 2:15 E211
PROFESSOR: TBD

Kinematics and dynamics of particles in three dimensions. Rotating coordinate systems. Hamilton's principle. Lagrange's equations of motion. Kinematics and dynamics of rigid bodies. (*Same as Aerospace Engineering 533: Engineering Science 533.*)(DE) *Prerequisite(s): 391 or Mathematics 431 and an undergraduate vibrations course.*

*ME 539 CONTINUUM MECHANICS (3) **CANCELLED**
SEC. 001 (Same as AE 539 & ES 539)
TEXT: TBD
TIME: Monday & Thursday 9:15 – 10:30 B112
PROFESSOR: Dr. Trevor 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. (*Same as Aerospace Engineering 539; Biomedical Engineering 539; Engineering Science 539*).

ME 540 PERTURBATION METHODS IN ENGINEERING (3)
SEC. 001 (Videotaped)
TIME: Monday 4:00 – 6:35 E111
TEXT: David C. Wilcox; Perturbation Methods in the Computer Age; DCW Industries, Inc.; 1995.
PROFESSOR: Dr. Joseph Majdalani

Solution of nonlinear problems in solid and fluid mechanics and dynamics by use of asymptotic perturbation techniques. Asymptotic expansions, regular and singular perturbations and applications in dynamics, celestial mechanics, potential, viscous and compressible flows. Uniformly valid approximations in various physical problems. Generalized boundary-layer techniques. Coordinate straining techniques; Poincare's method. Matched asymptotic expansions and multiple scales. Problems with several time or length scales. Examples taken from various fields of science. *Registration Permission: Consent of Instructor.*

ME 541 FLUID MECHANICS I (3)

SEC. 001 (Same as AE 541 & ES 541)
 TEXT: R.L. Panton: Incompressible Flow: Wiley Interscience; 3rd Ed.; ISBN# 047126122X.
 TIME: Tuesday & Friday 9:15 – 10:30 E211
 PROFESSOR: Dr. Basil Antar

Derivation of equations governing flow of inviscid and viscous fluids (conservation of mass, Newton's second law, conservation of energy). Equations of state and constitutive relations. Euler and Navier-Stokes forms and nondimensionalization. Exact solutions and introduction to potential and boundary-layer flows. (*Same as Aerospace Engineering 541; Engineering Science 541*). *Prerequisite: AE 511 or equivalent, or consent of instructor.*

*ME 561 FINITE ELEMENTS FOR ENGINEERING APPLICATIONS (3) **CANCELLED**
 SEC. 003 (Same as AE 571 & ES 551)
 TEXT: Class Notes/Handouts
 TIME: Tuesday & Friday 1:00 – 2:15 E210
 PROFESSOR: TBD

Modern computational theory applied to conservation principles across the engineering sciences. Weak forms, extremization, boundary conditions, discrete implementation via finite element, finite difference, finite volume methods. Asymptotic error estimates, accuracy, convergence, stability. Linear problem applications in 1, 2 and 3 dimensions, extensions to non-linearity, non-smooth data, unsteady, spectral analysis techniques, coupled equation systems. Computer projects in heat transfer, structural mechanics, mechanical vibrations, fluid mechanics, heat/mass transport. (*Same as Aerospace Engineering 571; Biomedical Engineering 561; Mechanical Engineering 561*). *Comment(s): Bachelor's degree in engineering or natural science required.*

ME 562 COMPUTATIONAL FLUID DYNAMICS (3)
 SEC. 001 (Same as AE 572 & ES 552)
 TEXT: TBD
 TIME: Monday & Thursday 3:00 – 4:15 B210
 PROFESSOR: Dr. John Steinhoff

Modern techniques in computing fluid dynamic flows will be covered. First, different classes of flows will be reviewed, and the most appropriate methods that satisfy both the physics requirements (capture the essential physics), and the engineering requirements (time required to set up and compute solutions) will be discussed. Methods suited for general configurations (blunt bodies) and methods suited for streamlined bodies, such as aircraft will be contrasted. The types of problems for which incompressible methods or compressible methods are best used, as well as those for which turbulence modeling is required will be covered. Accuracy issues and requirements will be covered, both for fully resolved flows and flows where turbulence modeling is needed. Particular equations to be covered include Potential, Euler, and (for laminar flow) Navier Stokes, as well as "Large Eddy Simulation" and "Reynolds Averaged Navier Stokes" for modeling turbulent flows. For compressible flows, methods involving shock capturing, with higher order schemes and limiters will be covered. For general flows, methods involving efficient treatment of concentrated vortices, passive scalar transport, as well as free surfaces will also be covered. (*Same as Aerospace Engineering 572; Engineering Science 552*).

*ME 581 ROCKET PROPULSION I (3) **CANCELLED**
 SEC. 001
 TEXT: Rocket Propulsion Elements; George P. and Biblarz, Oscar; Wiley; 7th Edition; ISBN# 041326429.
 TIME: Tuesday & Friday 3:00 – 5:15 B210
 PROFESSOR: Dr. Joseph Majdalani

Rocket propulsion fundamentals; thermodynamics of non-reacting and chemically reacting ideal gases, rocket nozzle design; ideal rocket performance parameters; rocket heat transfer; chemistry of propellants; liquid rocket engine systems; ground testing; introduction to solid propellant rockets.

*ME 584 TURBOMACHINERY I (3) **CANCELLED**
SEC. 001 (Videotaped)

TEXT: Jack D. Mattingly: Elements of Gas Turbine Propulsion; AIAA Educator Series,
Latest ed., ISBN# 1-56347-778-5.

TIME: Tuesday & Thursday 4:00 – 5:15 E111

PROFESSOR: Dr. Milt Davis

The course will provide a review of gas dynamics, an analysis of ideal cycle analysis of turbine engines along with engine design concepts. Methods for analyzing engine performance for turbojets, turbofans and turboprops will be studied for both ideal and real cycles. The course will emphasize the use of numerical simulations as tools for use in analyzing gas turbine engine performance and connect engine testing with analysis processes.

ME 590 SELECTED ENGINEERING PROBLEMS (2-6)

SEC: 001

PROFESSOR: Dr. Basil Antar

Enrollment limited to students in the problems option. (Grading Restriction: Satisfactory/No Credit grading only). *Registration Permission: Consent of advisor.*

ME 595 SEMINAR: AEROSPACE AND MECHANICAL SYSTEMS (1)

SEC. 001 PROFESSOR: Dr. Ahmad Vakili

ME 599 SPECIAL TOPICS: INDEPENDENT STUDY: COMPUTATIONAL FLUID
DYNAMICS (1-3)

SEC. 001

PROFESSOR: Dr. Joseph Majdalani

Repeatability: May be repeated. Maximum 6 hours. Registration Permission: Consent of Instructor.

ME 599 SPECIAL TOPICS: PARTICLE SIMULATIONS (3)

SEC. 003 (Same as AE 599 Sec. 001/ES 581 Sec. 002)

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

TEXT: Plasma Physics Via Computer Simulation; C.K. Birdsall and A.B. Langdon; Adam Hilger; 1st Edition; ISBN# 0-07-005371-5.

PROFESSOR: Dr. Trevor Moeller

Computer simulation of plasmas comprises two general areas: Fluid and particle descriptions. Fluid description, typically suited to higher plasma densities, are solved using magnetohydrodynamic equations assuming approximate transport coefficients and can be solved using computational fluid dynamics techniques. Many plasmas, however, are of low enough density that the fluid description no longer applies. In these situations, particle simulations are used to simply compute the motions of a collection of charged particles, interacting with each other and applied external fields. This course will cover topics relevant to particle simulations, including particle in cell (PIC), Monte Carlo, particle weighting, particle movers, and field solvers. Students will gain experience with particle simulations through PIC software that is a

companion to the text. In addition to those interested in plasmas, this course will be of interest to those interested in particle simulations as they apply in rarified gases.

*ME 599 SPECIAL TOPICS: RADIATION TRANSPORT (3) **CANCELLED**
SEC. 004 (Same as AE 599 Sec. 002/ES 581 Sec. 003)
TIME: Tuesday & Friday 10:45 – 12:00 F252
TEXT: Thermal Radiation Heat Transfer; Robert Siegel and John R. Howell; Taylor and Francis;
4th Edition; ISBN# 1-56032-839-8.
PROFESSOR: Dr. Trevor Moeller

Supplemental Text: Maher I. Boulos, Pierre Fauchais, and Emil Pfender, Thermal Plasmas: Fundamentals and Applications; Vol. 1; Plenum Press; ISBN # 0-306-44607-3.

This course will cover fundamental radiation processes that occur in absorbing, emitting, and radiating media (plasmas and high temperature gases). Topics will include: blackbody radiation concepts, fundamentals of radiation in matter, classical radiation, quantum theory of radiation, line broadening, continuum radiation, equilibrium relations, and an introduction to spectral diagnostics of plasmas.

ME 600 DOCTORAL AND RESEARCH DISSERTATION (3 - 15)
SEC. 014 Schulz
015 Vakili
016 Majdalani
017 Steinhoff
018 Flandro
019 Antar
028 Desmidt

*ME 651 ADVANCED TOPICS IN COMPUTATIONAL FLUID DYNAMICS (3) **CANCELLED**
SEC. 001 (Same as AE 661 & ES 651)
TEXT: TBD
TIME: Monday & Thursday 2:30 – 3:45 E210
PROFESSOR: TBD

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*). Prerequisite(s): 552.

PHYSICS

PHYS 500 MASTER'S THESIS (3, 6, or 9)
SEC. 002 Crater
003 Lewis
004 Parigger
005 Chen
006 Davis
007 McGregor

PHYS 501 GRADUATE RESEARCH PARTICIPATION (3)
SEC. 002
TEXT: TBD

TIME: Tuesday & Friday 1:00 – 2:15 F252
PROFESSOR: Dr. Ann Chen

Advanced research techniques under supervision of staff research director whose research area coincides with interests of student.

PHYS 503 PHYSICS COLLOQUIUM (1)
SEC. 002 (REQUIRED OF ALL PHYSICS STUDENTS)
TEXT: No text required for this course
TIME: Monday & Thursday 2:30 – 3:45 F252
PROFESSOR: Dr. Lloyd Davis

Admission to graduate program required
Physics seminar presentations of current topics by students, faculty, and invited speakers.

PHYS 511 THEORETICAL PHYSICS (3)
SEC. 001
TIME: Monday & Thursday 8:30 – 9:45 E111
TEXT: Theoretical Physics – Mechanics; Constant; Addison Wesley.
PROFESSOR: Dr. Horace Crater

This course will serve as a bridge for students wishing to enter the physics program at UTSI who do not have a physics undergraduate degree or whose background needs expanding before taking the core physics courses of Mechanics (Phys 531), Electrodynamics (Phys 541), quantum mechanics (Phys. 521-22), and statistical mechanics (Phys. 551). It will also serve those students not in the physics program who need the background to take these core courses. The mathematics required will be calculus and ordinary differential equations. Any math beyond this will be taught only as needed by the physics developed in the course. This course will be a general physics course at an intermediate level and include concepts and applications in applied physics. Topics included for the first semester will be kinematics and dynamics of one-body, two-body, and rigid body motion, elasticity, fluid and heat flow, and thermodynamics. The second semester will include topics in kinetic theory, statistical mechanics, electrostatics, magneto-statics, electrodynamics, and physical optics. Special topic may be included depending on student interest. This course in the past has been taught so as to be self paced.

PHYS 513 PROBLEMS IN THEORETICAL PHYSICS I (3)
SEC. 002 (Interactive from UTK, Distance Ed)
TEXT: Check with Instructor
TIME: Wednesday 10:15 – 11:30 E113
PROFESSOR: Dr. Marianne Breinig (UTK Faculty)

Fundamentals of physics: classical mechanics (Newtonian mechanics, Lagrangian and Hamiltonian dynamics) and electrostatics and magnetostatics.

PHYS 521 QUANTUM MECHANICS (3)
SEC. 002
TEXT: Quantum Mechanics; Franz Schwabl; Springer; 4th Edition (2007) for Fall 2009, (2008) for Spring 2010; ISBN# 978-3-540-71932-8 (Fall 09) and 978-3-540-85061-8 (Spring 2010).
TIME: Monday & Thursday 1:00 – 2:15 F252
PROFESSOR: Dr. Christian Parigger

Fundamental principles of quantum mechanics, angular momentum, electron spin, particles in electric and magnetic fields, perturbation theory, variational methods, scattering theory; second

quantization, quantization of electromagnetic field, emission, absorption, and scattering of light, bremsstrahlung, pair creation and annihilation. Application of quantum mechanics to problems of atomic, molecular, nuclear, and solid state physics.

The course syllabus (lecture series and exercises) is designed to be attractive for pure and applied Science students. References to classical “Quantum Mechanics” texts such as Sakurai, Cohen-Tannoudji *et al.*, and Greiner’s books “Quantum Mechanics, An Introduction” and “Quantum Mechanics, Special Chapters” will be made.

This course is part I of a two-part course series, recommended to be taken in sequence. The above description of the course covers both 521 and 522, although for the spring 522 “Quantum Mechanics,” Schwabl’s “Advanced Quantum Mechanics” book, 4th edition (2008) will also be used. For Fall 2009 and Spring 2010, UT’s electronic “blackboard” will be used.

***PHYS 551 STATISTICAL MECHANICS (3) CANCELLED**
SEC. 002
TEXT: TBD
TIME: Tuesday & Friday 7:45 – 9:00 F252
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. *Prerequisite(s): 521, 531 and 571.*

PHYS 561 THE THEORY OF RELATIVITY (3)
SEC. 004
TIME: Monday & Thursday 10:45 – 12:00 B-210
TEXT: Gravitation and Cosmology: Principles and Applications of the General Theory of Relativity; Steven Weinberg.
PROFESSOR: Dr. Horace Crater

Geometry of space-time, relativistic electrodynamics, particle mechanics and continuum mechanics, Einstein’s gravitational field equations, Schwarzschild solutions, the classical tests of general relativity. The course will be in the nature of a survey course, including special class problems. One example would be the formulation and solution of the two-body problem in general relativity.

PHYS 571 MATHEMATICAL METHODS IN PHYSICS I (3)
SEC. 002 (Same as Math 517)
TIME: Monday & Thursday 10:45 – 12:00 F252
TEXT: Mathematical Methods for Physicists; George Arfken and Hans Weber; Elsevier; 6th Edition (2005); ISBN #: 0-12-059876-0.
PROFESSOR: Dr. Christian Parigger

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. (*Same as Mathematics 517.*) *Recommended Background: Advanced calculus and differential equations.*

The course syllabus (lecture series and exercises) is designed to be attractive for pure and applied Science students. References to classical books such as “Methods of Mathematical Physics Vol I and II” by Courant & Hilbert will be made over and above references to classical Physics problems usually found in “Classical Mechanics,” “Electrodynamics,” “Quantum Mechanics,”

“Statistical Mechanics,” or “Solid State Physics.” This course is followed in spring 2010 by the PHYS573 “Numerical Methods in Physics.” Also, while PHYS571 is cross-referenced as the same as MATH517, this course qualifies as a Physics portion for students seeking the so-called “Interdisciplinary Graduate Minor in Computer Science.” For Fall 2009 and Spring 2010, UT’s electronic “blackboard” will be used.

PHYS 593 INDEPENDENT STUDY (1)
SEC. 002
TEXT: Journal articles on single-molecule spectroscopy.
TIME: Friday 3:45 – 5:00 F253
PROFESSOR: Dr. Lloyd Davis

Topics in Classical Physics.

*PHYS 599 SEMINARS (1-3) **CANCELLED**
SEC. 005
TEXT: TBD
TIME: Monday & Thursday 9:15 – 10:30 F253
PROFESSOR: Dr. Lloyd Davis

(a) Mechanics; (b) Radiation; (c) Heat and Thermodynamics; (d) Electricity and Magnetism; (e) Modern Physics. *Repeatability: may be repeated with consent of department. Maximum 18 hours.*

PHYS 600 DISSERTATION (1 - 15)
SEC. 002 Crater
003 Lewis
004 Parigger
005 Chen
006 Davis

PHYS 610 QUANTUM OPTICS (3)
SEC. 001 (Interactive/Videotape to UTK)
TEXT: TBD
TIME: Tuesday & Thursday 8:15 – 9:30 E113
PROFESSOR: Dr. Lloyd Davis

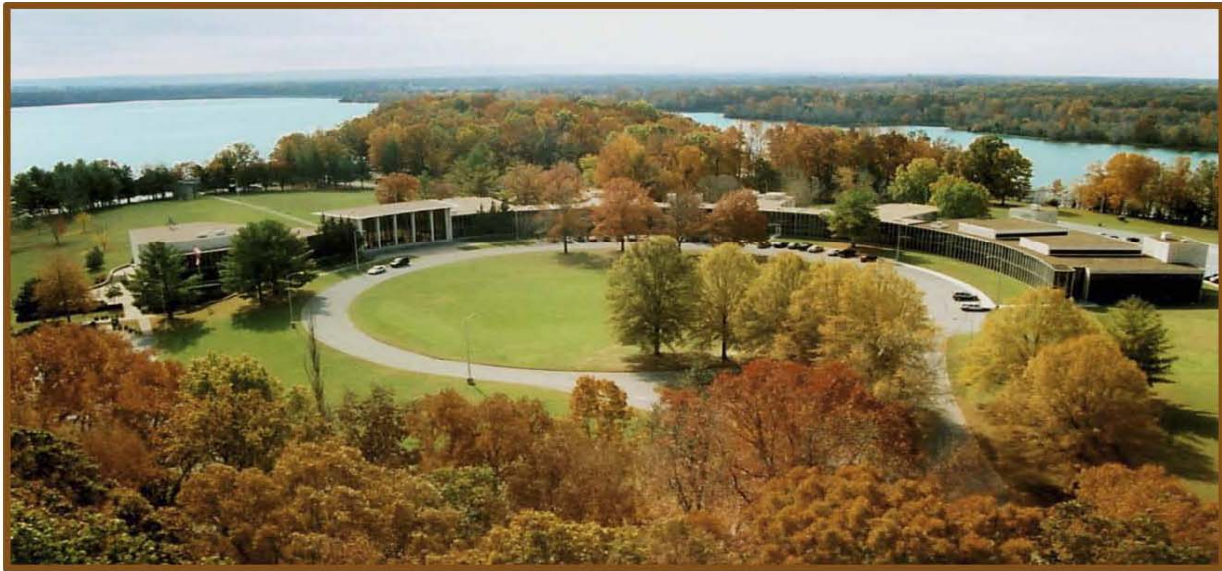
Quantum theory of emission and absorption of radiation; frequency-dependent susceptibility; coherence theory; field quantization and coherent photon states; interaction of radiation with atoms; photon optics, counting and higher-order coherence; atomic scattering phenomena.

PHYS 627 ELEMENTARY PARTICLE PHYSICS – ADVANCED TOPICS (3)
SEC. 001
TIME: Monday & Thursday 7:45 – 9:00 B210
TEXT: Particle Physics and Introduction to Field Theory; T.D. Lee.
PROFESSOR: Dr. Horace Crater

Advanced topics – quark models, electroweak interactions, and unification of elementary forces.
Comment: Intended for students specializing in the field.

FALL 2009

Registration Announcement



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