Spring 2011

Registration Announcement

THE UNIVERSITY of TENNESSEE

SPACE INSTITUTE

411 B.H. Goethert Parkway
Tullahoma, TN 37388-9700
888-822-8874 x-37228
www.utsi.edu

See Inside for Online Registration Instructions
https://my.utk.edu

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Publication Number: E02-4001-002-11

CALENDAR - 2011 SPRING SEMESTER

Priority Registration ..... September 30, 2010 – January 5, 2011
Admission to Candidacy Forms for Spring 2011 Commencement ..... November 30, 2010
Spring 2011 Graduation Application Deadline ..... November 30, 2010
University Closed, but CPO.UTK.EDU is available ..... December 24 – 31, 2010
Late Registration and late fees begin ..... January 6 – January 21, 2011
Classes begin ..... January 12, 2011
Last Day to Late Register, Add, Change Grading Options or Drop
Without a "W" ..... January 21, 2011
Martin Luther King Holiday ..... January 17, 2011
Last day to add/change credit with signatures ..... January 21, 2011
Graduation Fee Payment Deadline (MS $30, PhD $75) ..... March 4, 2011
Preliminary Thesis/Dissertation Review Deadline ..... March 4, 2011
Last day to schedule final exam (thesis) ..... March 25, 2011
Last day to schedule final exam (non-thesis/capstone students) ..... March 25, 2011
Spring Break (No Classes) ..... March 14 - 18, 2011
Last day to schedule final exam (dissertation) ..... April 1, 2011
Purchase cap and gown and order hood ..... April 1, 2011
Register to attend the Graduate Hooding Ceremony (http://gradschool.utk.edu) ..... April 1, 2010
Drop with a "W" ..... March 21, 2011
Last day to take final exam (thesis/dissertation students) ..... April 8, 2011
Last day to take final exam (non-thesis/capstone students) ..... April 8, 2011
Spring Recess (No Classes) ..... April 22, 2011
Electronic Thesis/Dissertation due in Knoxville (5:00 P.M. EST) ..... April 21, 2011
Submit report of final examination (Pass/Fail) form ..... April 21, 2011
Deadline for Submission of Admission to Candidacy for students
Graduating Summer 2011 and Graduation Application ..... TBD
Deadline for removing "INCOMPLETE" grades ..... April 29, 2011
Classes End ..... April 29, 2011
Total Withdraw from the University Deadline ..... April 29, 2011
Study Period ..... May 2, 2011
Exam Period ..... May 3, 4, 5, 2011
Graduate Hooding Ceremony (UTK) ..... May 12, 2011
COMMENCEMENT (UTK) ..... May 11, 2011
Second thesis/dissertation deadline (Student will receive diploma August 2011
but do not have to register for Summer 2012) (Defense Completed by April 29th) . May 27, 2011

SUMMER SEMESTER 2011

Priority Registration for Summer Semester 2011 UTSI begins ..... TBD
Final Registration for UTSI students ..... TBD
Memorial Day Holiday ..... May 30, 2011
Classes begin ..... June 2, 2011
July 4th Holiday ..... July 4, 2011
Classes End ..... August 9, 2011
Summer Graduation Date on Transcript (No Ceremony) ..... August 17, 2011

SPRING SEMESTER 2011
FINAL STUDY DAY AND EXAM SCHEDULE

LAST DAY OF CLASSES.....April 29, 2011

STUDY PERIOD .....May 2, 2011

FINAL EXAMS 2011

REGULAR CLASS TIME	(Same Classroom)	EXAM TIME
	1st Day – Tuesday 3, 2011	
7:45 - 9:00	M/Th	7:45 - 9:45
10:45 - 12:00	M/Th	10:15 - 12:15
9:15 - 10:30	M/Th	1:00 - 3:00
2:30 - 3:45	M/Th	3:30 - 5:30
	2nd Day – Wednesday 4, 2011	
9:15 - 10:30	Tu/Fri	7:45 - 9:45
10:45 - 12:00	Tu/Fri	10:15 - 12:15
1:00 - 2:15	Tu/Fri	1:00 - 3:00
2:30 - 3:45	Tu/Fri	3:30 - 5:30
	3rd Day – Thursday 5, 2011	
7:45 - 9:00	Tu/Fri	7:45 - 9:45
1:00 - 2:15	M/Th	10:15 - 12:15

**** ATTENTION ****

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

NO CLASSES WILL BE IN SESSION
AT THIS TIME

REGISTRATION ANNOUNCEMENT
SPRING SEMESTER 2011

REGISTRATION PROCEDURE

ADVISING

Graduate students should contact their departmental faculty to arrange an advising appointment. For students not accepted into specific programs, the Assistant to the Dean of Graduate Studies or his/her designee may act as advisor. The web registration system will ask if you have discussed your program with your advisor. Answer 'yes' if you have; otherwise, you cannot continue with the registration process. Graduate School Web Page: http://gradstudies.utk.edu/ .

REGISTRATION

Beginning Spring 2011 semester, the new Banner registration will be implemented. Students will register at https://my.utk.edu. You will need to log in using your NetID and your NetID password. The following instructions were provided by UTK:

*Log in to MyUTK. You can find a link by looking under "M" on the A-Z index (http://www.utk.edu/alpha/) or by typing myutk.utk.edu directly into your browser. You will need to log in by typing "utk\your NetID" in the "username" field, replacing "your NetID" with your actual NetID, and then your NetID password in the "password" field.

*Before you attempt to register, clear and pay any financial holds (parking tickets, library fines, fees, etc.) at Circle Park Online (http://cpo.utk.edu).

*Look under the "For Your Review" heading on the MyUTK portal page (located in the upper right-hand corner) for notification of any holds you may have.

*Once you are logged into "My UTK," scroll down to "UTK Student Links." "Click on "Search for Classes" to look up sections and then register.

*Print a copy of your schedule when you are finished registering.

If you have any questions, call the Office of the University Registrar at 865-974-2101 or contact Charlene Hane in Student Services room D-100, phone 931-393-7228, email chane@utsi.edu.

Registration will go live September 30. There will be a special priority registration for a selected number of students September 23 between 11:00 AM and 3:30 PM (Central Time) to validate the new system. Students who have been selected for the special priority registration have been contacted by UTK's Registrar Office. If you have been selected, please try registering and if you have any problems please contact Charlene Hane, Student Services.

Financial Calendar for Spring Term 2011

Last Registration Day for Receiving Statements by Mail	November 16, 2010
Statement Information Available on CPO	November 16, 2010
Priority Registration Payment/Confirmation Deadline	January 5, 2011 (3:30 pm CST)
Late Registration/Late Fees Begin	January 6, 2011
Late Payment and Confirmation Deadline	January 21, 2011 (3:30 pm CST)

CREDIT CARD PAYMENTS

**** NOTE:** If you pay your fees using Circle Park Online (CPO) using a credit/debit card (Discover, VISA, Mastercard) you will be accessed 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 37297or 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)-37213
Bookstore:	1-888-822-UTSI (8874)-37204
Business Office:	1-888-822-UTSI (8874)-37297
Student Services	1-888-822-UTSI (8874)-37228

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. 37204 or 37314 or by email Robin Nee at rnee@utsi.edu or Vicki Carr at vcarr@utsi.edu

APPLICATION FOR ADMISSION

No student will be allowed to register unless a completed Application for Admission to the Graduate School of the University of Tennessee, Knoxville (UTK) is on file in the Registrar's Office. An Application for Admission to the UTK Graduate School must be accompanied by a $35.00 non-refundable application fee, payable to The University of Tennessee Space Institute. Applicants are required to provide one official transcript of all undergraduate and graduate records. Students may apply on-line at http://admissions.utk.edu/graduate/apply.shtml [click on APPLY ONLINE and Follow Directions]. Send Applications for Admission, transcripts, GRE scores (if required); and if international application, TOEFL scores to the Admissions Office, A-200, Mail Stop 1, UTSI, Tullahoma, TN 37388-9700.

PAYMENT OF FEES

Payment of fees is due at time of registration. Late fees will begin on January 6, 2011. 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.	Charlotte Henley	931-393-7293	chenley@utsi.edu

TUITION AND/OR MAINTENANCE FEES*

Full Fees For In-State Students (per semester)

Maintenance Fee	$3,720.00*
Programs and Services Fee	90.00
Total	$3,810.00

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

Maintenance Fee	$3,720.00*
Programs and Services Fee	90.00
Tuition	$7,519.00*
Total	$11,329.00

*** BEGINNING FALL 2010 an additional $45.00 per credit hour with no cap will be charged to ALL ENGINEERING COURSES.**

***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	$414.00 per semester hour
3 hours	$1,242.00
OUT-OF-STATE	$1,250.00 per semester hour
3 hours	$3,750.00

ENGINEERING FEE

On July 1, 2007, the Computer Science Department merged with the Engineering Department. Beginning Fall 2008, a special per credit hour fee will be assessed on engineering and computer science courses offered through the College of Engineering and the College of Agricultural Sciences and Natural Resources. The additional funds will be used to acquire state-of-the-art equipment, expand first-year programs for Engineering students, and provide faculty with professional development opportunities to bring the latest knowledge into the classroom. The Colleges will retain the funds generated from this fee for their use.

PROGRAMS AND SERVICES FEE

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

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

RETURNED CHECK POLICY

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

DEFERRED PAYMENT PLAN

Although fees, rent and other University expenses are due and payable at the beginning of each term, a full-time student in good financial standing with a definite anticipated source of funds may request the deferment of up to 50% of the total charges at registration. The deferred payment must be paid by the 45th (February 2, 2011) 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 VOL*Xpress* 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 VOL*Xpress* statement. Accounts are subject to a late fee of $45.00 if there is an account balance at mid-semester. The fee is assessed in addition to the unpaid fees and charges and the account balance must be paid in order to access registration services, receive a transcript, grades, or a diploma.

TUITION/FEES POLICY FOR DROPPED COURSES OR WITHDRAWAL

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

****

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

****

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

DROP DATE	CHARGE	REFUND
January 13 - 17	NO CHARGE	100%
January 18 - 23	20% CHARGE	80%
January 24 - 28	40% CHARGE	60%
January 29 – February 2	60% CHARGE	40%
February 3 - 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 Charlene Hane, Student Services, and required to file a Change of Registration form with Charlene Hane, UTSI, Office 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 the previous 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, which 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 Charlene Hane, Student Services, 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 MyUTK or contact Charlene Hane, Student Services, Office D-100, (931) 393-7228.

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 Charlene Hane, Student Services 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 Associate Executive Director.

REMOVAL OF INCOMPLETE GRADES

All Incomplete Grades (I) must be removed prior to graduation. The instructor, in consultation with the student, decides the terms for the removal of the I, including the time limit for removal. If the I is not removed within one calendar year, the grade will be changed to an F. The course will not be counted in the cumulative grade point average until a final grade is assigned. No student may graduate with an I on the record. Students planning to graduate Spring Semester 2011 must remove all INCOMPLETE GRADES by **April 29, 2011.** Contact Charlene Hane, Student Services, to remove an Incomplete Grade.

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 a completed and signed Admission to Candidacy Application at least one semester prior to receiving the degree.

Candidacy committee changes or course changes must be submitted to the committee chairman using a Revision form. If changing from a thesis option to a non-thesis option or vice versa, a new Admission to Candidacy Application must be submitted. All forms must be processed through Student Services.

DOCTORAL DEGREE:

A Doctoral Committee should be formed during the student's first year of doctoral study. Any changes to the doctoral committee (deletions or additions) must be submitted to the Committee Chairman using a Revision form for approval. Each doctoral student is responsible for submitting a completed Admission to Candidacy form signed by the doctoral committee at least one semester prior to receiving the degree. All forms must be processed through Student services.

CONTINUOUS REGISTRATION OF DOCTORAL STUDENTS

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

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

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

final examination. In case of a grade of "Fail", the candidate may not apply for re-examination until the following semester. The result of the second examination is final.

UT POLICY ON INSURANCE FOR INTERNATIONAL STUDENTS

All foreign national students registered with the University of Tennessee, Knoxville, are required to have comprehensive medical insurance. The policy for the 2010-2011 academic year is provided by Aetna. The premium must be paid before registration. Contact the Human Resources Office (C-104 ext. 37267) for further information.

GENERAL SEMINAR

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

FINAL EXAM DATES FOR SPRING SEMESTER 2011

STUDY PERIOD....May 2, 2011
FINAL EXAMS.....May 3, 4, & 5, 2011

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 from Charlene Hane, Student Services, 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.

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

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

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

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

SPECIAL ANNOUNCEMENT

THOMAS JEFFERSON LECTURE

April, 2011(Tentative)

3:00 P.M.

UTSI Auditorium

There will be **NO** scheduled classes at this time by request of
Dr. Buddy Moore, Executive Director of The University of Tennessee Space Institute

Faculty will reschedule any afternoon classes tentatively scheduled for
April, 2011 (Tentative) between 2:30 – 3:45 p.m.
Contact Charlene Hane, Student Services
For available times and rooms for rescheduling

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

THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE
SPRING SEMESTER 2011 COURSE LISTINGS

AEROSPACE ENGINEERING

AE 500 Master's Thesis (1 - 15)
SEC. 009 Antar
011 Majdalani
012 Moeller
013 Steinhoff
014 Vakili
015 Moulden
021 Corda
022 Solies
023 Vakili
024 Flandro

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

AE 512 VISCOUS FLOW (3)
SEC. 001 (Videotaped at UTSI)
TIME: Monday & Thursday 9:00 – 10:15 E111
TEXT: F. White: Viscous Flow; 2nd Ed., ISBN# 0-07-069712-4
PROFESSOR: Dr. Ahmad Vakili

Derivation of fundamental equations of compressible viscous flow; boundary conditions for viscous heat-conducting flow; exact solutions for Newtonian viscous flow (Navier-Stokes) equations for special cases; similarity solutions. Thermal boundary layers, stability of laminar flows, transition to turbulence, 2-D turbulent boundary layer equations. Incompressible-turbulent mean flow, and compressible boundary layer flow. *Registration Permission: Consent of instructor.*

AE 521 AERODYNAMICS OF COMPRESSIBLE FLUIDS (3)
SEC. 001
TEXT: John D. Anderson: Modern Compressible Flow: With Historical Perspectives
McGraw-Hill, 3rd edition, ISBN 0-07-242443-5
(students can use previous editions which are more affordable)
TIME: Monday & Thursday 4:30 – 5:45 E211
PROFESSOR: Dr. Roy Schulz

One-dimensional internal and external flow; waves; small perturbation theory; slender body theory; similarity rules; method of characteristics. *Prerequisite(s): 422.*

AE 535 MECHANICAL VIBRATIONS (3)
SEC. 002 (Pre-recorded Lectures)
PROFESSOR: Dr. Joseph A. Boulet (UTK)

Vibrations of linear, discrete, undamped and damped systems. Lagrange's equations for holonomic systems. Modal analysis. Laplace transform. Response to mechanical transients. *Cross-listed: (Same as Biomedical Engineering 534; Engineering Science 534 and Mechanical Engineering 534.) Recommended Background: An undergraduate vibrations course*

AE 542 FLUID MECHANICS II (3)
SEC. 001 (Same as ES 542/ME 542)
TIME: Tuesday & Friday 9:15 – 10:30 E211
TEXT: 1. H. Tennekes & J. Lumley: A First Course in Turbulence, MIT, Latest Ed.
2. R.L. Panton: Incompressible Flow; Wiley Interscience; Latest publications
PROFESSOR: Dr. Basil Antar

Equations of viscous fluid flows. Basic concepts and equations of turbulent flow. Separation, stability and transition. Laminar and turbulent boundary-layer flows. Exact, approximate, and numerical solutions. *Cross-listed: (Same as Aerospace Engineering 542; Engineering Science 542.) (DE) Prerequisite(s): 541.*

AE 562 FUNDAMENTALS OF AEROACOUSTICS (3)
SEC. 001
TIME: Monday & Wednesday 11:00 – 12:15 E211
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 590 SELECTED ENGINEERING PROBLEMS (1-3)
SEC. 001 Dr. Basil Antar
SEC. 003 Dr. Ahmad Vakili

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

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

AE 599 AIRCRAFT DESIGN (3)
SEC. 001 (Cross-Listed as AS506 Section 001) Videotaped from UTSI
TIME: Tuesday & Friday 1:00 – 2:15 E111
TEXT: D.P. Raymer: Aircraft Design: A Conceptual Approach; AIAA Education Series;
3rd Ed., 1998 ISBN # 1-56347-281-0
PROFESSOR: Dr. U. Peter Solies

Design process, compromise of conflicting requirements, economical, industrial, and legal aspects. Definition of mission requirements, synthesis and optimization techniques, safety and reliability, systems integration, standards and regulations, teamwork, and decision-making process.

AE 599 SPECIAL TOPICS: RADIATION TRANSPORT (3)
SEC. 003 (Same as ME 599 Sec. 003//ES 581 Sec. 001)
TIME: Tuesday & Friday 10:45 – 12:00 F252
TEXT: Thermal Radiation Heat Transfer; Robert Siegel and John R. Howell; Taylor and Francis;
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 DISSERTATION (3 - 15)
SEC. 005 Antar
006 Moeller
007 Majdalani
008 Steinhoff
010 Corda
017 Vakili
018 Flandro

AE 661 ADVANCED TOPICS IN COMPUTATIONAL FLUID DYNAMICS (3)
SEC. 001 (Same as ES 651/ ME 651)
TEXT: TBD
TIME: Monday & Thursday 4:00 – 5:15 B210
PROFESSOR: Dr. John Steinhoff

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

COMMENT*:* New methods developed for computing vortex dominated flows – "Vorticity Confinement" computations of incompressible flows with thin shed vortex sheets and boundary layers. Rapid computational methods for complex, blunt bodies. Role of nonlinear solitary waves and relation to phase field methods. In addition, related methods for short pulse propagation with wave equation.

AE 690 ADVANCED TOPICS IN AE: ADVANCED PERTURBATION METHODS (3)
SEC. 002 (Video Recorded)
TEXT: Class Notes
TIME: Monday & Wednesday 5:30 – 6:45 E111
PROFESSOR: Dr. Joseph Majdalani

The purpose of this course is to advance students through real life problems requiring the subtle use of asymptotic methods. The goal is to solve problems that arise in propulsion related applications or other fields of science. By the end of the course students will be able to: understand the use of several advanced perturbation techniques; these include: 1) WKB Method (Type I and Type II) with Multiple Distinguished Limits 2) Latta's Method of Composite Expansions 3) Method of Averaging (van der Pol's Method/ Krylov-Bogoliubov Method) 4) Asymptotic Expansion of Integrals (Watson's Lemma) 5) Laplace's Method.

Obtain perturbation solutions to complex physical settings involving small or large parameters; understand how to model highly oscillatory solutions; treat partial differential equations; treat problems exhibiting a nonlinear scaling structure; treat compressible flow problems. *Prerequisites: Differential Equations and Perturbation Methods I.*

AE 690 SPECIAL TOPICS IN AE: ADVANCED PLASMA PHYSICS I (3)
SEC. 003
TIME: Tuesday & Friday 1:00 – 2:15 F252
TEXT: Fundamentals of Plasma Dynamics, E.H. Holt and R.E. Haskell; Supplemental texts may also be used.
PROFESSOR: Dr. Trevor Moeller

Basic concepts of high temperature plasma physics. Magnetohydrodynamics and kinetic descriptions of plasma, plasma transport, plasma waves, equilibrium, and stability. (RE) Prerequisite(s): 541, 542 and 461, 462 or 563, 564, or consent of instructor. Comment(s): 663 and 664 must be taken in sequence. Registration Restriction(s): Minimum student level graduate.

PHYS 643 COMPUTATIONAL PHYSICS (3)
SEC. 001 (Video Recorded)
TEXT: TBD
TIME: Wednesday 1:00 – 2:15 E111
Thursday 1:00 – 3:45 E111
PROFESSOR: Dr. Christian Parigger

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

Comments/Text:

The Computational Physics Phys643 course includes several invited lectures from various universities. The syllabus shows contents derived mainly from two books: (i) Numerical Recipes, 3-rd edition, [NR], and (ii) A Survey of Computational Physics, Princeton 2008 edition, [CP]. Emphasize the last 10 chapters of the CP-book, and the last 11 chapters of the NR-book. Basically focus on second half of both books. And there will be elaboration on several research problems and solutions. There will be selected, advanced problems as well, e.g., Rabi-oscillations' numerical solution, Monte-Carlo solution of Feynman-Path-Integral, Numerical solution of integral equations (viz. scattering). And from time to time other books will be referenced as well, e.g., DeVries "A first Course in Computational Physics" or Zwillinger "Handbook of Differential Equations." The latter shows reasonable portion (30%) of numerical solutions of ODE's and PDE's other than very good classifications. Selected exercises will be assigned. Such exercise will be due and discussed well ahead of the due time, both e-mail and potentially e-video will be used.

Further Information:

This 600-level course shows departmental and registration system enforced pre-requisites of Mathematical Methods for Physicists (Phys571 or Math517), Classical Mechanics (Phys531) and Quantum Mechanics (Phys521). For an interdisciplinary, 600-level course at UTSI, these pre-requisites may need to be reviewed, possibly similar courses maybe allowed in place of these Physics courses. This approach of cross-recognition would be reasonable for our PhD students. For example, Numerical Mathematics courses (Math571/572) may be acceptable in place of Phys571, Thermodynamics I/II (ME521/522) in place of Phys521 [ME521/522 shows explicit reference to "kinetic theory, statistical mechanics, quantum physics, Schroedinger equation"] and Fluid Mechanics I/II (ME541/542) in place of Classical Mechanics. **Engineering students are encouraged to enroll.**

Specific Topics Include: Fourier Series/transforms, Autocorrelation, An-harmonic oscillator, Classical Chaotic Scattering, Bifurcations and Chaotic Pendulum, Digital Wavelet Transform, Logistic Map, High-Throughput Computing: Condor, High-Performance Computing: Mpich2,Metropolis algorithm, Feynman Path Integration, Radiation Transfer Equation and Diffusion for Photon Transport in Biological Tissue, Diffusion Limited Aggregation, Diffusion Limited Aggregation, Molecular Dynamics Simulations, Finite Element Method via Galerkin Spectral Decomposition, Crank-Nicolson Method, Wave Equation for a String, Time-dependent Schroedinger Equation: Quantum Wave Packet Implementation and Animation, Diffraction of a 2D Wave Packet, Circularly polarized Electromagnetic Waves, Burgers Shock Equation, Korteweg and deVries Equation (solitons), Navier Stokes Equation, Gaussian Integration for Integral Equations, Delta-Shell Potential Scattering.

AVIATION SYSTEMS

AS 500 MASTER'S THESIS (1 - 15)
SEC. 001 Corda
003 Martos
004 Muratore
005 Pujol
006 Solies

AS 502 REGISTRATION FOR USE OF FACILITIES (1-15)
SEC. 001 Corda
003 Martos
004 Muratore
005 Pujol
006 Solies

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

AS 506 AIRCRAFT DESIGN (3)
SEC. 001 (Cross Listed as AE 599 Section 001) (Video Recorded)
TIME: Tuesday & Friday 1:00 – 2:15 E111
TEXT: D. P. Raymer: Aircraft Design: A Conceptual Approach; AIAA Education Series; 3rd Ed., 1998. ISBN # 1-56347-281-0

PROFESSOR: Dr. U. Peter Solies

Design process, compromise of conflicting requirements, economical, industrial, and legal aspects. Definition of mission requirements, synthesis and optimization techniques, safety and reliability, systems integration, standards and regulations, teamwork, and decision-making process.

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

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

AS 510 SPECIAL TOPICS: SYSTEMS ENGINEERING (3)
SEC. 002 (Video Recorded)
TIME: Monday & Thursday 1:30 – 2:45 E113
TEXT: Inviting Disaster – Lessons from the Edge of Technology; James R. Chiles; ISBN 0-06-662081-3;
The Secret of Apollo, Systems Management in the American and European Space Programs; Stephen B. Johnson; ISBN 0-8018-8542-6.
PROFESSOR: John Muratore

The focus of this course is on engineering problem solving in multi-disciplinary applications with complex systems interactions. Instruction will be provided in methodologies and tools used to deal with large complex systems to deliver system performance that meets user requirements. Methodologies discussed will include system life cycles, requirements development, verification and validation, engineering review processes, hazard analysis, fault trees, reliability block diagrams, system flow diagrams, weight and cost estimating, technical budget management, engineering economic analysis, interface control, and deterministic and monte carlo definition of integrated flight design environments. Special topics will include software integration; interconnect wiring, fault tolerance and redundancy management.

AS 516 Aircraft Flight Controls (Stability and Control)
SEC. 001 (Interactive Receive)
TIME: Monday & Thursday 10:30 – 11:45 E111
TEXT: Introduction To Aircraft Flight Mechanics; Yechout, Morris, Bossert, and Hallgren; AIAA Press; 1st Edition; ISBN # 10:1-56347-577-4, ISBN # 13:978-1-56347-577-1.
PROFESSOR: John Muratore

Feedback control concepts, root locus techniques, bode analysis, PID control design, and controller and observer design concepts applied to aircraft. Complex analysis and matrix algebra.

COMMENT: Static and dynamic longitudinal, directional, and lateral stability of aerospace vehicles will be investigated. Topics include:

- Contribution of vehicle components to stability and control
- Motion with fixed and free control surfaces

- Steady flight and maneuvering flight
- Flight test techniques
- Introduction to control theory and design of automatic controls

AS 521 EXPERIMENTAL FLIGHT MECHANICS: FIXED WING PERFORMANCE (3)
SEC. 001
TIME: Tuesday & Friday 9:30 – 10:45 Tullahoma Airport Classroom
TEXT: Ralph D. Kimberlin: Flight Testing of Fixed-Wing Aircraft; AIAA Education Series; ISBN# 1 56347 564 2
PROFESSOR: Borja Martos

Performance. Experimental techniques for flight mechanics. Specially equipped airborne laboratory: student participation in series of experiments demonstrating acquisition of flight test data. Necessary theory supports class experiments. Tests cover broad range of aircraft performance, stability and control characteristics in addition to instrumentation and data reduction methods. *(DE) Prerequisite(s): Aerospace Engineering 422.*

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

AS 550 PROJECT IN AVIATION SYSTEMS (3)
SEC. 001 Corda
003 Martos
004 Muratore
005 Pujol
006 Solies

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

BIOMEDICAL ENGINEERING

BE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)
SEC. 001 (Video Recorded) (Same as CBE/ECE/IE/MSE/ME 529)
TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Latest Edition; ISBN# 978-1-4200-9524-4.
TIME: Tuesday & Friday 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. *Cross-listed: (Same as Chemical and Biomolecular Engineering 529; Electrical and Computer Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529;*

Mechanical Engineering 529.) Comment(s): Graduate standing or consent of instructor required.

COMMENT: Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

BE 534 MECHANICAL VIBRATIONS (3)
SEC. 002 (Pre-recorded Lectures)
PROFESSOR: Dr. Joseph A. Boulet (UTK)

Vibrations of linear, discrete, undamped and damped systems. Lagrange's equations for holonomic systems. Modal analysis. Laplace transform. Response to mechanical transients. *Cross-listed: (Same as Aerospace Engineering 535; Engineering Science 534 and Mechanical Engineering 534) Recommended Background: An undergraduate vibrations course.*

CHEMICAL/BIOMOLECULAR ENGINEERING

CBE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)
SEC. 001 (Video Recorded) (Same as BE/ECE/IE/MSE/ME 529)
TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Latest Edition; ISBN# 978-1-4200-9524-4.
TIME: Tuesday & Friday 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. *Cross-listed: (Same as Biomedical Engineering 529; Electrical and Computer Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529.) Comment(s): Graduate standing or consent of instructor required.*

COMMENT: Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

COMPUTER SCIENCE

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

CS 472 NUMERICAL LINEAR ALGEBRA (3)
SEC. 001 Videotaped Recorded (Same as Math 472)
TEXT: Burden & Faires: Numerical Analysis; 8th Ed., Brooks/Cole; ISBN: 0-534-38216-9

TIME: Monday & Wednesday 2:30 – 3:45 E111
PROFESSOR: Dr. Trevor Moulden

Direct and iterative methods for systems of linear equations. Solution of single nonlinear equations and nonlinear systems. Orthogonal decomposition, least squares and algebraic eigenvalue problem. Applications of linear algebra to the solution of partial differential equations. *Prerequisite: Numerical Algorithms 1 or consent of instructor. Recommended prerequisite: 453.*

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

ECE 500 THESIS (1 – 15)
SEC. 006 Bomar
015 Pujol
018 Smith
022 Whitehead

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

ECE 502 REGISTRATION FOR USE OF FACILITIES (1-15)
SEC. 002 Smith

ECE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)
SEC. 001 (Video Recorded) (Same as BE/CBE/IE/MSE/ME 529)
TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Latest Edition; ISBN# 978-1-4200-9524-4.
TIME: Tuesday & Friday 10:00 – 11:15 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. *Cross-listed: (Same as Biomedical Engineering 529; Chemical and Biomolecular Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529.) Comment(s): Graduate standing or consent of instructor required.*

COMMENT: Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value

decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

ECE 600 DOCTORAL RESEARCH AND DISSERTATION (3-15)
SEC. 006 Dr. Bruce Bomar

ECE 663 FUNDAMENTALS OF PLASMA DYNAMICS I (3)
SEC. 001
TIME: Tuesday & Friday 1:00 – 2:15 F252
TEXT: Fundamentals of Plasma Dynamics, E.H. Holt and R.E. Haskell; Supplemental texts may also be used.
PROFESSOR: Dr. Trevor Moeller

Basic concepts of high temperature plasma physics. Magnetohydrodynamics and kinetic descriptions of plasma, plasma transport, plasma waves, equilibrium, and stability.
(RE) Prerequisite(s): 541, 542 and 461, 462 or 563, 564, or consent of instructor.
Comment(s): 663 and 664 must be taken in sequence.
Registration Restriction(s): Minimum student level – graduate.

ENGINEERING SCIENCE

ES 500 Master's Thesis (1 - 15)
SEC. 010 Antar
012 Majdalani
013 Moeller
014 Steinhoff
015 Vakili

ES 534 MECHANICAL VIBRATIONS (3)
SEC. 002 (Pre-recorded Lectures)
PROFESSOR: Dr. Joseph A. Boulet (UTK)

Vibrations of linear, discrete, undamped and damped systems. Lagrange's equations for holonomic systems. Modal analysis. Laplace transform. Response to mechanical transients. *Cross-listed: (Same as Aerospace Engineering 535; Biomedical Engineering 534; and Mechanical Engineering 534) Recommended Background: An undergraduate vibrations course.*

ES 542 FLUID MECHANICS II (3)
SEC. 001 (Same as AE 542/ME 542)
TIME: Tuesday & Friday 9:15 – 10:30 E211
TEXT: 1. H. Tennekes & J. Lumley: A First Course in Turbulence, MIT, Latest Ed.
2. R.L. Panton: Incompressible Flow; Wiley Interscience; Latest publications
PROFESSOR: Dr. Basil Antar

Equations of viscous fluid flows. Basic concepts and equations of turbulent flow. Separation, stability and transition. Laminar and turbulent boundary-layer flows. Exact, approximate, and numerical solutions. *Cross-listed: (Same as Aerospace Engineering 542; Engineering Science 542.) (DE) Prerequisite(s): 541.*

ES 581 SPECIAL TOPICS: RADIATION TRANSPORT (3)
SEC. 001 (Same as ME 599 Sec. 003//AE 599 Sec. 003)
TIME: Tuesday & Friday 10:45 – 12:00 F252
TEXT: Thermal Radiation Heat Transfer; Robert Siegel and John R. Howell; Taylor and Francis;
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 595 SEMINARS: ENGINEERING SCIENCE (1)
SEC. 002 Dr. Ahmad Vakili (Same as AE595/ME 595)

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

ES 600 DOCTORAL & RESEARCH DISSERTATION (1 – 15)
SEC. 004 Antar
006 Majdalani
007 Steinhoff
008 Moeller

ES 651 ADVANCED TOPICS IN COMPUTATIONAL FLUID DYNAMICS (3)
SEC. 001 (Same as AE 661/ ME 651)
TEXT: TBD
TIME: Monday & Thursday 4:00 – 5:15 B210
PROFESSOR: Dr. John Steinhoff

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

COMMENT: New methods developed for computing vortex dominated flows – "Vorticity Confinement" computations of incompressible flows with thin shed vortex sheets and boundary layers. Rapid computational methods for complex, blunt bodies. Role of nonlinear solitary waves and relation to phase field methods. In addition, related methods for short pulse propagation with wave equation.

PHYS 643 COMPUTATIONAL PHYSICS (3)
SEC. 001 (Video Recorded)
TEXT: TBD

TIME:	Wednesday	1:00 – 2:15	E111
	Thursday	1:00 – 3:45	E111
PROFESSOR:		Dr. Christian Parigger	

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

Comments/Text:

The Computational Physics Phys643 course includes several invited lectures from various universities. The syllabus shows contents derived mainly from two books: (i) Numerical Recipes, 3-rd edition, [NR], and (ii) A Survey of Computational Physics, Princeton 2008 edition, [CP]. Emphasize the last 10 chapters of the CP-book, and the last 11 chapters of the NR-book. Basically focus on second half of both books. And there will be elaboration on several research problems and solutions. There will be selected, advanced problems as well, e.g., Rabi-oscillations' numerical solution, Monte-Carlo solution of Feynman-Path-Integral, Numerical solution of integral equations (viz. scattering). And from time to time other books will be referenced as well, e.g., DeVries "A first Course in Computational Physics" or Zwillinger "Handbook of Differential Equations." The latter shows reasonable portion (30%) of numerical solutions of ODE's and PDE's other than very good classifications. Selected exercises will be assigned. Such exercise will be due and discussed well ahead of the due time, both e-mail and potentially e-video will be used.

Further Information:

This 600-level course shows departmental and registration system enforced pre-requisites of Mathematical Methods for Physicists (Phys571 or Math517), Classical Mechanics (Phys531) and Quantum Mechanics (Phys521). For an interdisciplinary, 600-level course at UTSI, these pre-requisites may need to be reviewed, possibly similar courses maybe allowed in place of these Physics courses. This approach of cross-recognition would be reasonable for our PhD students. For example, Numerical Mathematics courses (Math571/572) may be acceptable in place of Phys571, Thermodynamics I/II (ME521/522) in place of Phys521 [ME521/522 shows explicit reference to "kinetic theory, statistical mechanics, quantum physics, Schroedinger equation"] and Fluid Mechanics I/II (ME541/542) in place of Classical Mechanics. **Engineering students are encouraged to enroll.**

Specific Topics Include: Fourier Series/transforms, Autocorrelation, An-harmonic oscillator, Classical Chaotic Scattering, Bifurcations and Chaotic Pendulum, Digital Wavelet Transform, Logistic Map, High-Throughput Computing: Condor, High-Performance Computing: Mpich2,Metropolis algorithm, Feynman Path Integration, Radiation Transfer Equation and Diffusion for Photon Transport in Biological Tissue, Diffusion Limited Aggregation, Diffusion Limited Aggregation, Molecular Dynamics Simulations, Finite Element Method via Galerkin Spectral Decomposition, Crank-Nicolson Method, Wave Equation for a String, Time-dependent Schroedinger Equation: Quantum Wave Packet Implementation and Animation, Diffraction of a 2D Wave Packet, Circularly polarized Electromagnetic Waves, Burgers Shock Equation,

Korteweg and deVries Equation (solitons), Navier Stokes Equation, Gaussian Integration for Integral Equations, Delta-Shell Potential Scattering.

ENGINEERING MANAGEMENT

EM 501 CAPSTONE PROJECT (3 - 6)
SEC. 001 Dr. Gregory Sedrick
SEC. 002 Dr. 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 (1 – 15)
SEC. 001 Dr. Gregory Sedrick
SEC. 002 Dr. 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 533 THEORY AND PRACTICE OF ENGINEERING MANAGEMENT (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/iieandem/student_services.htm
TIME: Thursday 4:00 – 6:35 E111
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 534 FINANCIAL MANAGEMENT (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
TIME: Tuesday 4:00 – 6:35 E111
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Gregory Sedrick

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

EM 541 MANAGING CHANGE AND IMPROVEMENT IN TECHNICAL 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
SEC. 004 UTK Students participating elsewhere
TIME: Monday 4:00 – 6:35 E113
PROFESSOR: Dr. Denise Jackson

Current topics, theories, and applications for managing change and innovation of performance improvement in organizations. Multi-initiative approaches: quality management, organizational effectiveness, employee empowerment, performance measurement, and application of statistical tools and techniques. Self-assessment for performance excellence. Change agent, team building, and leadership issues. Case studies.

EM 595 SPECIAL TOPICS IN ENGINEERING MANAGEMENT (3)
SEC. 001 Sedrick

EM 691 ADVANCED TOPICS IN ENGINEERING MANAGEMENT (3)
SEC. 001 Sedrick

INDUSTRIAL ENGINEERING

IE 500 THESIS (1-15)
SEC. 002 Dr. Denise Jackson as main advisor
SEC. 006 Dr. Gregory Sedrick as main advisor

IE 514 ADVANCED INFORMATION SYSTEMS ANALYSIS (3)
SEC. 001 All Students participating at Knoxville
SEC. 002 UTK Students participating elsewhere
SEC. 003 UTSI Students participating at Tullahoma or Oak Ridge
004 UTSI Students participating elsewhere
TIME: CENTRA
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Xueping Li
Systems analysis and systems control concepts applied to systems of information. Role of IE in office and factory of future. Management support systems, decision support systems, and integrated support systems.

IE 518 ADVANCED ENGINEERING ECONOMIC ANALYSIS (3)
SEC. 001 UTK Students participating at Knoxville DE Classrooms
SEC. 002 UTK Students participating elsewhere
SEC. 003 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI Students participating elsewhere
TIME: Wednesday 4:00 – 6:35 E113

TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Joseph Wilck

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

IE 522 OPTIMIZATION METHODS IN INDUSTRIAL ENGINEERING (3)
SEC. 001 All Students participating at Knoxville
SEC. 002 UTK Students participating elsewhere
SEC. 003 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI Students participating elsewhere
TIME: CENTRA
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Charles Aiken

Classical optimization applied to constrained and unconstrained, non-linear, multi-variable functions; search techniques; decision making under uncertainty; game theory; and dynamic programming.

IE 527 LEAN PRODUCTION SYSTEMS (3)
SEC. 001 All Students participating at Knoxville
SEC. 002 UTK Students participating elsewhere
SEC. 003 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI Students participating elsewhere
TIME: CENTRA
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Joseph Stainback

Strategies for planning, development and implementation of Lean. Emphasis on integration of people, technology, processes and information dimensions (including product development, production and extended supply chain) into unified frameworks. Applications will be implemented into industry with work to further develop lean principles. *(DE) Prerequisite(s): 515 or consent of instructor.*

IE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)
SEC. 001 (Video Recorded) (Same as BE/CBE/ECE/MSE/ME 529)
TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Latest Edition; ISBN# 978-1-4200-9524-4.
TIME: Tuesday & Friday 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. *Cross-listed: (Same as Biomedical Engineering 529; Chemical and Biomolecular Engineering 529; Electrical and Computer Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529.) Comment(s): Graduate standing or consent of instructor required.*

COMMENT: Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

IE 592 SPECIAL TOPICS IN INDUSTRIAL ENGINEERING (1-3)
SEC. 002 Sedrick

IE 600 DOCTORAL RESEARCH/DISSERTATION (3-15)
SEC. 002 Jackson
SEC. 006 Sedrick

IE 691 ADVANCED TOPICS IN INDUSTRIAL ENGINEERING (3)
SEC. 002 Sedrick

IE 692 ADVANCED TOPICS IN INDUSTRIAL ENGINEERING (3)
SEC. 001 Sedrick

MATERIALS SCIENCE

MSE 500 THESIS (1 – 15)
SEC. 002 Dr. William Hofmeister
SEC. 004 Dr. George Murray
SEC. 005 Dr. Jackie Johnson

MSE 503 GRADUATE SEMINAR IN MATERIALS SCIENCE & ENGINEERING (1)
SEC. 002
TIME: Wednesday 3:00 CLA Conference Room
PROFESSOR: Dr. Zhongren Yue

Theme: Biomimetic materials. *Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 6 hours. Credit Restriction: For MS students, a maximum of 3 hours may be applied to the major. For PhD students with MS, a maximum of 3*

hours may be applied to the major. For PhD students directly from BS, a maximum of 6 hours may be applied to the major. Comment(s): Admission to graduate program required.

MSE 514 FUNDAMENTALS OF MATERIAL SCIENCE AND ENGINEERING IV (3)
SEC. 002
TIME: Tuesday & Friday 2:30 – 3:45 F252
TEXT: TBD
PROFESSOR: Dr. Jackie Johnson

Electronics, optics and magnetism: electrical and thermal conduction, quantum physics, band theory, dielectrics, magnetic and optical properties.

MSE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)
SEC. 001 (Video Recorded) (Same as BE/CBE/ECE/IE/ME 529)
TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Latest Edition; ISBN# 978-1-4200-9524-4.
TIME: Tuesday & Friday 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. *Cross-listed: (Same as Biomedical Engineering 529; Chemical and Biomolecular Engineering 529; Electrical and Computer Engineering 529; Industrial Engineering 529; Mechanical Engineering 529.) Comment(s): Graduate standing or consent of instructor required.*

COMMENT: Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

MSE 543 BASIC POLYMER PHYSICS (3)
SEC. 001
TIME: Tuesday & Friday 1:00 – 2:30 CLA Conference Room
TEXT: TBD
PROFESSOR: Dr. George Murray

Essential structure-property relations in materials. Physical structure of polymers. Mechanical, electrical and thermal properties.

MSE 600 DIRECT DOCTORAL DISSERTATION (1-15)
SEC. 002 Dr. William Hofmeister
SEC. 003 Dr. Jackie Johnson

MATHEMATICS

MATH 435 PARTIAL DIFFERENTIAL EQUATIONS (3)
SEC. 002 (Video Recorded)
TIME: Tuesday & Friday 10:30 – 11:45 E111
TEXT: Richard Haberman: Applied Partial Differential Equations with Fourier Services and Boundary Value Problems; Prentice Hall; 4th Ed., ISBN# 013-065243-1
PROFESSOR: Dr. Kenneth Kimble

Separation of variables, Fourier series, solution of Lapace, wave and heat equations. *Prerequisite: Differential Equations and Calculus III.*

MATH 472 NUMERICAL LINEAR ALGEBRA (3)
SEC. 001 (Video Recorded) (Same as CS 472)
TEXT: Burden & Faires: Numerical Analysis; 8th Ed., Brooks/Cole; ISBN: 0-534-38216-9
TIME: Monday & Wednesday 2:30 – 3:45 E111
PROFESSOR: Dr. Trevor Moulden

Direct and iterative methods for systems of linear equations. Solution of single nonlinear equations and nonlinear systems. Orthogonal decomposition, least squares and algebraic eigenvalue problem. Applications of linear algebra to the solution of partial differential equations. *Prerequisite: Numerical Algorithms 1 or consent of instructor. Recommended prerequisite: 453.*

MATH 500 MASTER'S THESIS (1 - 15)
SEC. 003 Dr. K.C. Reddy

MATH 518 MATHEMATICAL METHODS IN PHYSICS II (3)
SEC. 002 (Same as Phys 572)
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

Advance Problems. Topics may vary according to interests of students and instructor. *Cross-listed: (Same as Physics 572.)*

COMMENT: 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 572.) *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." Also, while PHYS572 is cross-referenced as the same as MATH518, this course qualifies as a Physics portion for students seeking the so-called "Interdisciplinary Graduate Minor in Computer Science." *Prerequisite for Spring 2011 Math 517/Phys 571.* For Fall 2010 and Spring 2011, UT's electronic "blackboard" will be used.

*MATH 519 SEMINAR IN APPLIED MATHEMATICS (1-3) **CANCELLED**
SEC. 002
TEXT: Notes provided by Instructor
TIME: Monday & Thursday 9:15 – 10:30 B210
PROFESSOR: Dr. K.C. Reddy

Repeatability: May be repeated. Maximum 12 hours.

MATH 535 PARTIAL DIFFERENTIAL EQUATIONS I (3)
SEC. 001
TEXT: Partial Differential Equations of Mathematics Physics and Integral Equations; Ronald B. Guenther and John W. Lee.
TIME: Tuesday & Thursday 4:00 – 5:15 E113
PROFESSOR: Dr. K.C. Reddy

First order partial differential equations, classification of second order partial differential equations, properties of elliptic, parabolic and hyperbolic partial differential equations. *Recommended Background: One year of advanced calculus.*

*MATH 593 INDEPENDENT STUDY (1-12) **CANCELLED**
SEC. 002 Dr. K.C. Reddy

MECHANICAL ENGINEERING

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

ME 512 HEAT TRANSFER II (3)
SEC. 001
TIME: Tuesday & Friday 1:00 – 2:15 E113
TEXT: Adrain Bejan: Convection Heat Transfer; 2nd Ed., John Wiley & Sons, ISBN# 0471579726
PROFESSOR: Dr. Basil Antar

Analysis of steady-state and time-dependent heat conduction by numerical methods. Analysis of laminar and turbulent convection heat transfer in internal and external flows, forced and buoyancy driven flows. *(DE) Prerequisite(s): 541.*

ME 522 THERMODYNAMICS II (3)
SEC. 001

TEXT: Yunus A. Cengel, Michael A. Boles, Thermodynamics, An Engineering Approach; 5th Ed., McGraw Hill, 2006, ISBN 0-07-288495-9 plus Instructor's Notes.
TIME: Wednesday& Friday 8:30 – 9:45 E113
PROFESSOR: Dr. Robert McAmis

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

ME 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)
SEC. 001 (Video Recorded) (Same as BE/CBE/ECE/IE/MSE 529)
TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Latest Edition; ISBN# 978-1-4200-9524-4.
TIME: Tuesday & Friday 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. *Cross-listed: (Same as Biomedical Engineering 529; Chemical and Biomolecular Engineering 529; Electrical and Computer Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529.) Comment(s): Graduate standing or consent of instructor required.*

COMMENT: Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

ME 534 MECHANICAL VIBRATIONS (3)
SEC. 002 (Pre-recorded Lectures)
PROFESSOR: Dr. Joseph A. Boulet (UTK)

Vibrations of linear, discrete, undamped and damped systems. Lagrange's equations for holonomic systems. Modal analysis. Laplace transform. Response to mechanical transients. *Cross-listed: (Same as Aerospace Engineering 535; Biomedical Engineering 534; Engineering Science 534.) Recommended Background: An undergraduate vibrations course.*

ME 542 FLUID MECHANICS II (3)
SEC. 001 (Same as AE 542/ES 542)
TIME: Tuesday & Friday 9:15 – 10:30 E211
TEXT: 1. H. Tennekes & J. Lumley: A First Course in Turbulence, MIT, Latest Ed.
2. R.L. Panton: Incompressible Flow; Wiley Interscience; Latest publications
PROFESSOR: Dr. Basil Antar

Equations of viscous fluid flows. Basic concepts and equations of turbulent flow. Separation, stability and transition. Laminar and turbulent boundary-layer flows. Exact, approximate, and numerical solutions. *Cross-listed: (Same as Aerospace Engineering 542; Engineering Science 542.) (DE) Prerequisite(s): 541.*

ME 585 TURBOMACHINERY SYSTEMS II (3)
SEC. 001 (Video Recorded)
TIME: Tuesday & Thursday 4:00 – 5:15 F252
TEXT: Jack D. Mattingly: Elements of Gas Turbine Propulsion; 1st Ed., AIAA Educator Series; ISBN# 1-56347-778-5
PROFESSOR: Dr. Milt Davis

Ideal cycle analysis of turbine engines, real cycle analysis, component performance analysis, component design and systems integration (inlets, nozzles, combustors, compressors, turbines), flowthrough theory, turbine engine component matching, transient operation, surge and rotating stall, engine control systems, structural considerations. *Comment(s): First-year graduate standing required. Registration Permission: Consent of instructor.*

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

ME 590 SELECTED ENGINEERING PROBLEMS (2-6)
SEC. 002 Dr. Montgomery Smith

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

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

ME 599 SPECIAL TOPICS: RADIATION TRANSPORT (3)
SEC. 003 (Same as AE 599 Sec. 003/ES 581 Sec. 002)
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. 015 Antar
016 Majdalani
018 Steinhoff
019 Moeller
027 Vakili

ME 651 ADVANCED TOPICS IN COMPUTATIONAL FLUID DYNAMICS (3)
SEC. 001 (Same as ES 651/ ME 651)
TEXT: TBD
TIME: Monday & Thursday 4:00 – 5:15 B210
PROFESSOR: Dr. John Steinhoff

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

PHYS 643 COMPUTATIONAL PHYSICS (3)
SEC. 001 (Video Recorded)
TEXT: TBD
TIME: Wednesday 1:00 – 2:15 E111
Thursday 1:00 – 3:45 E111
PROFESSOR: Dr. Christian Parigger

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

Comments/Text:

The Computational Physics Phys643 course includes several invited lectures from various universities. The syllabus shows contents derived mainly from two books: (i) Numerical Recipes, 3-rd edition, [NR], and (ii) A Survey of Computational Physics, Princeton 2008 edition, [CP]. Emphasize the last 10 chapters of the CP-book, and the last 11 chapters of the NR-book. Basically focus on second half of both books. And there will be elaboration on several research problems and solutions. There will be selected, advanced problems as well, e.g., Rabi-oscillations' numerical solution, Monte-Carlo solution of Feynman-Path-Integral, Numerical solution of integral equations (viz. scattering). And from time to time other books will be referenced as well, e.g., DeVries "A first Course in Computational Physics" or Zwillinger

"Handbook of Differential Equations." The latter shows reasonable portion (30%) of numerical solutions of ODE's and PDE's other than very good classifications. Selected exercises will be assigned. Such exercise will be due and discussed well ahead of the due time, both e-mail and potentially e-video will be used.

Further Information:

This 600-level course shows departmental and registration system enforced pre-requisites of Mathematical Methods for Physicists (Phys571 or Math517), Classical Mechanics (Phys531) and Quantum Mechanics (Phys521). For an interdisciplinary, 600-level course at UTSI, these pre-requisites may need to be reviewed, possibly similar courses maybe allowed in place of these Physics courses. This approach of cross-recognition would be reasonable for our PhD students. For example, Numerical Mathematics courses (Math571/572) may be acceptable in place of Phys571, Thermodynamics I/II (ME521/522) in place of Phys521 [ME521/522 shows explicit reference to "kinetic theory, statistical mechanics, quantum physics, Schroedinger equation"] and Fluid Mechanics I/II (ME541/542) in place of Classical Mechanics. **Engineering students are encouraged to enroll.**

Specific Topics Include: Fourier Series/transforms, Autocorrelation, An-harmonic oscillator, Classical Chaotic Scattering, Bifurcations and Chaotic Pendulum, Digital Wavelet Transform, Logistic Map, High-Throughput Computing: Condor, High-Performance Computing: Mpich2,Metropolis algorithm, Feynman Path Integration, Radiation Transfer Equation and Diffusion for Photon Transport in Biological Tissue, Diffusion Limited Aggregation, Diffusion Limited Aggregation, Molecular Dynamics Simulations, Finite Element Method via Galerkin Spectral Decomposition, Crank-Nicolson Method, Wave Equation for a String, Time-dependent Schroedinger Equation: Quantum Wave Packet Implementation and Animation, Diffraction of a 2D Wave Packet, Circularly polarized Electromagnetic Waves, Burgers Shock Equation, Korteweg and deVries Equation (solitons), Navier Stokes Equation, Gaussian Integration for Integral Equations, Delta-Shell Potential Scattering.

COMMENT: New methods developed for computing vortex dominated flows – "Vorticity Confinement" computations of incompressible flows with thin shed vortex sheets and boundary layers. Rapid computational methods for complex, blunt bodies. Role of nonlinear solitary waves and relation to phase field methods. In addition, related methods for short pulse propagation with wave equation.

PHYSICS

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

PHYS 503 PHYSICS COLLOQUIUM (1)
SEC. 002
TIME: Thursday 3:30 – 5:00 H-111
PROFESSOR: Dr. Horace Crater

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

PHYS 512 THEORETICAL PHYSICS II (3)
SEC. 002
TIME: Monday & Thursday 8:30 – 9:45 E113
PROFESSOR: Dr. Horace Crater

Concepts and applications in applied physics. Topics: electrostatic and magneto-static problems, EM waves, duality and quantization, absorption and emission, statistical ensemble and thermal equilibrium, and other modern applications of current interest, in areas of quantum chemistry, biophysics, optics, spectroscopy and astrophysics. *Recommended Background: Familiarity with computational methods.*

PHYS 514 PROBLEMS IN THEORETICAL PHYSICS II (4)
SEC. 002 (Interactive Transmission from Knoxville)
TIME: Wednesday 10:15 – 11:15 E113
TEXT: Core Concepts in Physics
PROFESSOR: Dr. Marianne Breinig

Fundamentals of physics: electrodynamics, relativity, and quantum mechanics.

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

PHYS 572 MATHEMATICAL METHODS IN PHYSICS II (3)
SEC. 002 (Same as Math 518)
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

Advance Problems. Topics may vary according to interests of students and instructor. *Cross-listed: (Same as Mathematics 518.)*

COMMENT: 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 Math 518.) *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." Also, while PHYS572 is cross-referenced as the same as MATH 518, this course qualifies as a Physics portion for students seeking the so-called "Interdisciplinary Graduate Minor in Computer Science." *Prerequisite for Spring 2011 Math 517/Phys 571.* For Fall 2010 and Spring 2011, UT's electronic "blackboard" will be used.

PHYS 573 NUMERICAL METHODS IN PHYSICS (3)
SEC. 002
TIME: Monday & Thursday 9:15 – 10:30 F252
TEXT: Survey of Computational Physics; Rubin Landau et al.; Princeton, (to appear in Summer 2008); Numerical Recipes, The Art of Scientific Computing; THIRD EDITION; W. H. Press et al., ISBN 978-0521-88068-8, (online version January 2008); and selected other references and example codes, e.g., Schmid et al, Theoretical Physics on the Personal Computer, Springer, 1990, including references to computer languages such as FORTRAN, C, C++, Java, and/or implementations of software packages/libraries. Focus of 573 will be the former sections of the Landau et al book (http://press.princeton.edu/titles/8704.html) and the Num. Recipes book.
PROFESSOR: Dr. Christian Parigger

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

COMMENT: This is a course recognized for the new interdisciplinary graduate minor program in computational science: http://igmcs.utk.edu.

PHYS 599 SEMINAR IN MODERN PHYSICS: OCULAR SCIENCE AND INSTRUMENTATION (3)
SEC. 007
TIME: Monday & Thursday 9:15 – 10:30 F253
TEXT: TBD
PROFESSOR: Dr. Ying Ling Ann Chen

Repeatability: May be repeated with consent of department. Maximum 18 hours.

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

PHYS 611 ADVANCED QUANTUM MECHANICS AND FIELD THEORY (3)
SEC. 002
TIME: Monday & Thursday 10:45 – 12:00 B210
TEXT: TBD
PROFESSOR: Dr. Horace Crater

Survey of problems and methods. Topics of current interest. *Comments: Intended for all Graduate students.*

PHYS 643 COMPUTATIONAL PHYSICS (3)
SEC. 001 (Video Recorded)
TEXT: TBD
TIME: Wednesday 1:00 – 2:15 E111
Thursday 1:00 – 3:45 E111
PROFESSOR: Dr. Christian Parigger

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

Comments/Text:

The Computational Physics Phys643 course includes several invited lectures from various universities. The syllabus shows contents derived mainly from two books: (i) Numerical Recipes, 3-rd edition, [NR], and (ii) A Survey of Computational Physics, Princeton 2008 edition, [CP]. Emphasize the last 10 chapters of the CP-book, and the last 11 chapters of the NR-book. Basically focus on second half of both books. And there will be elaboration on several research problems and solutions. There will be selected, advanced problems as well, e.g., Rabi-oscillations' numerical solution, Monte-Carlo solution of Feynman-Path-Integral, Numerical solution of integral equations (viz. scattering). And from time to time other books will be referenced as well, e.g., DeVries "A first Course in Computational Physics" or Zwillinger "Handbook of Differential Equations." The latter shows reasonable portion (30%) of numerical solutions of ODE's and PDE's other than very good classifications. Selected exercises will be assigned. Such exercise will be due and discussed well ahead of the due time, both e-mail and potentially e-video will be used.

Further Information:

This 600-level course shows departmental and registration system enforced pre-requisites of Mathematical Methods for Physicists (Phys571 or Math517), Classical Mechanics (Phys531) and Quantum Mechanics (Phys521). For an interdisciplinary, 600-level course at UTSI, these pre-requisites may need to be reviewed, possibly similar courses maybe allowed in place of these Physics courses. This approach of cross-recognition would be reasonable for our PhD students. For example, Numerical Mathematics courses (Math571/572) may be acceptable in place of Phys571, Thermodynamics I/II (ME521/522) in place of Phys521 [ME521/522 shows explicit reference to "kinetic theory, statistical mechanics, quantum physics, Schroedinger equation"] and Fluid Mechanics I/II (ME541/542) in place of Classical Mechanics. **Engineering students are encouraged to enroll.**

Specific Topics Include: Fourier Series/transforms, Autocorrelation, An-harmonic oscillator, Classical Chaotic Scattering, Bifurcations and Chaotic Pendulum, Digital Wavelet Transform, Logistic Map, High-Throughput Computing: Condor, High-Performance Computing: Mpich2,Metropolis algorithm, Feynman Path Integration, Radiation Transfer Equation and Diffusion for Photon Transport in Biological Tissue, Diffusion Limited Aggregation, Diffusion Limited Aggregation, Molecular Dynamics Simulations, Finite Element Method via Galerkin Spectral Decomposition, Crank-Nicolson Method, Wave Equation for a String, Time-dependent Schroedinger Equation: Quantum Wave Packet Implementation and Animation, Diffraction of a 2D Wave Packet, Circularly polarized Electromagnetic Waves, Burgers Shock Equation, Korteweg and deVries Equation (solitons), Navier Stokes Equation, Gaussian Integration for Integral Equations, Delta-Shell Potential Scattering.