

Spring 2017 Registration Announcement



THE UNIVERSITY OF
TENNESSEE
KNOXVILLE 
SPACE INSTITUTE AT TULLAHOMA

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CALENDAR - 2017 SPRING SEMESTER

Priority Registration.....	October 10, 2016 – January 10, 2017
Admission to Candidacy Forms for Spring 2017 Commencement	December 1, 2016
Spring 2017 Graduation Application Deadline (submit online)	December 1, 2016
Graduation Fee Payment Deadline (MS \$30, PhD \$75).....	December 1, 2016
Late Registration and late fees begin (\$100 Late Fee).....	January 11, 2017
Classes begin.....	January 11, 2017
Martin Luther King Holiday	January 16, 2017
Last Day to final register, add, change grading options or drop without a “W”.....	January 20, 2017
Late Registration and late fees after 14 th day (\$200)	January 25, 2017
Preliminary Thesis/Dissertation Review Deadline	February 24, 2017
Graduation and Graduate Hooding Ceremony dates to be announced go to: http://gradschool.utk.edu/graduation/graduate-hooding-ceremony/	
Spring Break (No Classes).....	March 13 - 17, 2017
Last day to schedule final exam (non-thesis/thesis/dissertation)	March 31, 2017
Drop with a “W”	April 4, 2017
Last day to take final exam (non-thesis/thesis/dissertation)	April 7, 2017
Spring Recess (No Classes)	April 14, 2017
Thesis/Dissertation Deadline 5:00 p.m. EST.....	April 19, 2017
Submit report of final examination (Pass/Fail) form	April 19, 2017
All "INCOMPLETE" must be removed for Graduation.....	April 28, 2017
Deadline for Submission of Admission to Candidacy for students Graduating Summer 2017 and Graduation Application.....	April 28, 2017
Classes End.....	April 28, 2017
Total Withdraw from the University Deadline	April 28, 2017
Study Period.....	May 1, 2017
Exam Period.....	May 2, 3, & 4, 2017
Graduate Hooding Ceremony (UTK)	May 11, 2017
COMMENCEMENT (UTK)	May 11 - 13, 2017
Official Graduation Date.....	May 13, 2017

Second thesis/dissertation deadlines

Defense Completed by April 28, 2017

Second Deadline Application Submitted by April 28, 2017

<http://gradschool.utk.edu/forms/Second%20Deadline%20Graduation%20Application.pdf>

Thesis/Dissertation Submission Deadline by May 19, 2017

(Student will receive diploma summer 2017 semester, but will not be required to register for thesis/dissertation credits)

SUMMER SEMESTER 2017

Priority Registration.....	TBD
Final Registration	TBD
Memorial Day Holiday	May 29, 2017
Classes begin.....	June 1, 2017
July 4 th Holiday	July 4, 2017
Classes End.....	August 11, 2017
Summer Graduation Date on Transcript (No Ceremony).....	August 12, 2017

Dates may be revised without notice. Please refer to the following sites for updates:

<http://gradschool.utk.edu/ddategraduation.shtml>

http://registrar.tennessee.edu/academic_calendar/index.shtml

**SPRING SEMESTER 2017
FINAL STUDY DAY AND EXAM SCHEDULE**

LAST DAY OF CLASSES.....April 28, 2017

STUDY PERIOD May 1, 2017

FINAL EXAMS

REGULAR CLASS TIME	(Same Classroom)	EXAM TIME
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1st Day – Tuesday, May 2, 2017

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 May 3, 2017

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

3rd Day – Thursday May 4, 2017

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 2017

REGISTRATION PROCEDURE

GRADUATE ACADEMIC ADVISING

Graduate students should contact your departmental faculty to arrange an advising appointment. If you're not accepted into a specific program, the assistant to the dean of graduate studies or the designee may act as your advisor. When the web registration system asks if you've discussed your program with your advisor, you must answer yes to continue with the registration process.

REGISTRATION

Students will register at <http://my.utk.edu>. You will need to log in using your NetID and your NetID password. If you do not know your NetID and NetID password, go to <http://onestop.utk.edu/your-classes/registering-for-classes/>.

*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 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.).

*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 Registration 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 A-206, phone 931-393-7228, email chane@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
Budget and Finance Office: 1-888-822-UTSI (8874)-37297
Student Services..... 1-888-822-UTSI (8874)-37228

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 should be completed online at <https://www.applyweb.com/utg> and must be accompanied by a \$60.00 non-refundable application fee, payable to The University of Tennessee Space Institute. All applicants are required to provide one official transcript of all undergraduate and graduate records, GRE test

scores and 3 letters of recommendation when applying. International applicants will also need to include TOEFL scores. Please select UT Space Institute if your plans are to attend the Tullahoma campus location. Only online applications will be accepted by Graduate Admissions Knoxville, TN.

Graduate Research Assistantship applications can be sent to the Director of Administrative and Student Affairs, University of Tennessee Space Institute, MS-1, Tullahoma, TN 37388-9700. All applications should be accompanied by undergraduate and graduate transcripts and GRE test scores are required for all departments. All International applicants will need to provide TOEFL test scores in addition to GRE's. All official transcripts and test scores should be sent to College Code 1843, Graduate Admissions Office, 201 Student Services Building, Knoxville, TN 37996-0221. A full admission will not be granted by Graduate Admissions until all official test scores and degree confirmation are received. Please contact Dee Merriman, Director of Administrative and Student Affairs, at (931) 393-7213 or 888-822-8874 if you have questions.

TOTAL WITHDRAWAL 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 A-206, (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/Summer semesters are considered full-time. Full-time enrollment for two consecutive semesters is required to full fill the admission to candidacy doctoral degree residency requirement. Graduate Research Assistants (GRAs) must be enrolled for 9 hours during the Fall/Spring semesters and 6 hours during the Summer. GRAs must also enroll in one of the MABE 595 seminars or a PHYS 599 seminar each semester in which seminars are offered, 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 2017 must remove all INCOMPLETE GRADES by April 28, 2017. 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 ENROLLMENT

All degree-seeking graduate students are expected to make a full commitment to their graduate and professional study in order to ensure that they can complete all degree requirements without unnecessary delay. Graduate students are therefore required to maintain an active status through continuous enrollment from the time of first enrollment until graduation.

Continuous enrollment is maintained by registering for a minimum of one graduate credit hour per semester (excluding the summer, unless stipulated otherwise by the program or department). However, students who have started taking dissertation hours (course 600) must maintain a minimum of three credit hours per semester during all semesters, including the summer, as stipulated in the policy on "Registration for Course 600 (Doctoral Research and Dissertation)" in order to comply with the Continuous Enrollment requirement (see under Doctoral Programs for details).

The minimum enrollment for international students may be different, and international students always need to check with the Center for International Education (CIE) in order to determine what minimum enrollment they need to maintain in order to satisfy all enrollment requirements attached to their specific visa.

CONSEQUENCES OF NON-ENROLLMENT WITHOUT LEAVE OF ABSENCE

Graduate students who do not maintain continuous enrollment as stipulated in the "Continuous Enrollment" policy will lose their active student status. A student who has lost his or her active status without having been granted a Leave of Absence for the period of non-enrollment ahead of time will not be allowed to continue in his her graduate program until readmitted. (see policy on "Readmission" in the Graduate Catalog for more details).

Non-enrollment other than during an approved Leave of Absence (LOA) does not alter or affect any of the milestone deadlines, such as admission to candidacy, time to degree, etc.

Upon approval for readmission to complete the interrupted degree program, students will be retroactively enrolled in every semester of missed enrollment for one graduate credit hour of Course 502 or for three graduate credit hours of Course 600 (whichever is appropriate). Students will be responsible for paying the past tuition charges and fees as well as the current university per semester late registration penalty. All past due charges will need to be paid before the Graduate School will approve the student for any future enrollment.

FINAL EXAM 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 Student Services. Failure to notify Student Services 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 2016-2017 academic year is provided by United HealthCare Student Resources. The premium must be paid before registration. Contact the Human Resources Office (room C-106 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

Study Period – May 1, 2017

Final Exams – May 2, 3, & 4, 2017

FINANCIAL CALENDAR, FEES, REFUNDS, AND TUITION

Please click <http://onestop.utk.edu/tuition-fees/> link to the most current information. You may also contact Jennifer Boyles in the Business and Finance Office at jboyles@utsi.edu or phone number 931-393-7297.

The UTSI Budget and Finance Accounts Receivable Office will no longer accept payment for tuition and fees by credit card. All students will need to login to MyUTK One Stop to make secure payments online.

Please see One Stop - Paying Tuition and Fees webpage for more details
<http://onestop.utk.edu/pay/>.

Credit or Debit Cards

There is a 2.75% service fee for these payments. UT has a contract with an outside vendor to provide this service. The vendor retains the fee in full.

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 at <http://catalog.utk.edu>. The student handbook "Hilltopics" is available online at <http://hilltopics.utk.edu/index.html>

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 1988 (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.

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

**The University of Tennessee Space Institute
Spring 2017 Course Listings**

AEROSPACE ENGINEERING

AE	500	Master's Thesis (1-15)	
SEC.	009	CRN 24259	Abedi
	012	CRN 24261	Brooks
	013	CRN 24262	Majdalani
	014	CRN 24263	Moeller
	015	CRN 24264	Schmisseur
	016	CRN 24265	Solies
	021	CRN 24270	Vakili
	022	CRN 25307	Zhang

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

AE	502	Registration for Use of Facilities (1-15)	
SEC.	002	CRN 24272	Moeller

Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

Credit Restriction: May not be used toward degree requirements.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate

AE	512	Viscous Flow (3)	
SEC.	001	CRN 24273	
TEXT:	Fundamental Mechanics of Fluids; 4 th Edition; Currie, I.G.; ISBN 978-1439874608		
TIME:	Monday & Wednesday	2:40 – 3:55	E-110
PROF:	Dr. Steve Brooks		

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	513	Experimental Methods in Fluid Mechanics (3)	
SEC.	001	CRN 30721	
TEXT:	J.R. Goldstein; <i>Fluid Mechanics Measurements</i> ; 2 nd Edition; Taylor and Francis		

ISBN 1-56032-306-X

TIME: Monday & Thursday 10:00 – 11:15 E-211
PROF: Dr. Ahmad Vakili

Experimental techniques with laboratory experiments; representative experiments: hot wire anemometry and turbulence measurements, flow visualization, wind tunnel tests, water table experiments, supersonic flow experiments, boundary layer measurements, laser-optical measurements.

(DE) Prerequisite(s): 541.

AE 518 Computation Fluid Dynamics (3)
SEC. 002 CRN 29682
TEXT: TBD
TIME: Tuesday & Thursday 10:10 – 11:25 E-110
PROF: Dr. Kivanc Ekici

Finite difference and finite volume techniques for solving compressible and incompressible fluid flow problems. Classification of partial differential equations and their discrete approximations. Explicit and Implicit techniques for solving unsteady Euler and Navier-Stokes equations including finite volume and finite difference formulations. Formulation of boundary conditions, artificial viscosity and multigrid acceleration. Stability analysis and convergence. Grid generation.

Cross-listed: (Same as Mechanical Engineering 518; Biomedical Engineering 518.)

*Recommended Background: Fluid mechanics, differential equations, and compressible flows.
Registration Permission: Consent of instructor.*

AE 532 Introduction to Turbulence (3)
SEC. 001 CRN 29703
TEXT: *Turbulent Flows*; S.B. Pope; Cambridge University Press · Paperback · 771 pages
ISBN: 0521598869
TIME: Monday & Wednesday 10:10 – 11:25 E-110
PROF: Dr. John Schmisser

Macroscopic effects, analogies, statistical treatment, correlation functions, energy spectra, diffusion; application of turbulent jets and pipe flow.

(DE) Prerequisite(s): 511 and 512.

AE532: Introduction to Turbulence will provide a solid foundation in the fundamentals of the theory of turbulent flows and their application within the analysis of flows of current engineering interest.

Course Goals:

- Familiarize students with the broad spectrum of current methods used to study turbulent flows
- Enable students to make discriminating choices with regard to the application of current methods

AE 557 Aerospace Vehicle Flutter and Vibration (3)
SEC. 001 CRN 31577
TEXT: *Aircraft Vibration and Flutter*; Scanlan, R.H. and Rosenbaum, R; Dover Publications; New York, NY; 1968
TIME: Wednesday 2:30 – 5:00 E-111
PROF: Dr. Peter Solies

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

(DE) Prerequisite(s): 551.

AE 569 Plasma Dynamics (3)
SEC. 001 CRN 31752
TEXT: *Fundamentals of Plasma Dynamics*, E.H. Holt and R.E. Haskell, (used versions are available via Amazon); Supplemental texts may also be used.
TIME: Monday & Thursday 1:00 – 2:15 E-113
PROF: Dr. Trevor Moeller

Fundamental concepts of plasma including electromagnetic theory, collision processes, kinetic theory, microscopic and macroscopic descriptions, transport properties, and magnetohydrodynamic analysis.
Recommended Background: Vector calculus and graduate fluid mechanics.
Registration Permission: Consent of Instructor.

AE 590 Selected Engineering Problems (2-6)
SEC. 001 CRN 24278 Abedi
004 CRN 25786 Brooks
005 CRN 25787 Majdalani
006 CRN 25788 Moeller
007 CRN 25789 Schmisser
008 CRN 25790 Solies
009 CRN 25791 Vakili
010 CRN 28047 Zhang

Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Enrollment limited to students in problems option.
Registration Permission: Consent of advisor.

AE 595 Aerospace Engineering Seminar (1)
SEC. 001 CRN 24280
TEXT: None
TIME: Will be announced through email
PROF: Dr. Ahmad Vakili

All phases of aerospace engineering, reports on current research at the University of Tennessee, Knoxville, and UTSI.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 20 hours.

AE 599 Special Topics: Aircraft Flight Controls (Same as AVSY 516 001 CRN 24354) (3)
SEC. 005 CRN 25644
TEXT: Nelson, Robert C; *Flight Stability and Automatic Control*; 2nd Edition 1988 or later; McGraw-Hill, NY; ISBN 0-07-046273-9
TIME: Tuesday & Friday 1:00 – 2:15 E-111
PROF: Dr. Peter Solies

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, and introduction to control theory and design of automatic controls.
Repeatability: May be repeated. Maximum 6 hours.

AE 599 Special Topics: Thin Film Enhancement of Biomedical Devices (3)
 SEC. 006 CRN 25419 (Same as BME 599 010 CRN 31531, ME 599 015 CRN 29666,
 MSE 576 001 CRN 31714)
 TEXT: TBD
 TIME: Monday & Wednesday 1:10 – 2:25 E-110
 PROF: Dr. Jackie Johnson

Overview of the fundamentals of selected thin film deposition techniques and pertinent instrumentation with an emphasis on applications to biomaterials. Structural characterization and tailoring of thin films for implant-specific applications. [Growth of thin films on biomaterial surfaces](#), the biological interface and biocompatibility. Uniformity, adhesion, cytotoxicity and bacterial reduction synergy. Application of thin films in tissue engineering and stem cell technologies.

Recommended Background: BME 474 and BME 486

Registration Permission: Consent of instructor is required if from a different background than BME.

AE 599 Special Topics: Combustion and Chemically Reacting Flows II (3)
 SEC. 008 CRN 26540 (Same as ME 599 006 CRN 26323)
 TEXT: *An Introduction to Combustion: Concepts and Applications*; 3rd Edition;
 Stephen Turns; ISBN-13: 978-0073380193; ISBN-10: 0073380199
 Available from Amazon.com:

https://www.amazon.com/Introduction-Combustion-Concepts-Applications/dp/0073380199/ref=mt_hardcover?_encoding=UTF8&me=

TIME: Tuesday & Friday 1:00 – 2:15 E-113
 PROF: Dr. Trevor Moeller

Advanced topics: phenomenological approaches to turbulent flames; fundamentals of turbulent flow; application of probability density functions to turbulent flames; turbulent reacting flows with premixed and/or non-premixed reactants; spray combustion models; fluidized bed combustion; chemically reacting boundary layer flow; gas turbine and/or rocket motor combustors; furnaces; introduction to supersonic combustion and hypersonic flows.

(DE) Prerequisite(s): 525.

AE 599 Special Topics: Data Measurement and Analysis (3)
 SEC. 011 CRN 28490 (Same as ME 599 005 CRN 27376)
 TEXT: *Random Data: Analysis and Measurement Procedures*; Julius S. Bendat and Allan G. Piersol;
 Wiley; 4th Edition; ISBN 978-0-470-24877-5
 TIME: Tuesday & Thursday 11:15 – 12:30 E-113
 PROF: Dr. Phillip Kreth

Tools for random data analysis (including types of random data, mean values, mean-square values, probability density and distribution functions, moments and characteristic functions, spectral and correlation analyses); bias and random error estimates in data measurements; input-output system models; measurement examples.

AE 599 Special Topics: Experimental Flight Mechanics: Fixed Wing Performance (3)
 SEC. 014 CRN 29663 (Same as AVSY 521 001 CRN 24355)
 TEXT: *Flight Testing of Fixed Wing Aircraft*; Ralph D. Kimberlin; AIAA; First Edition;
 ISBN 1-56347-564-2
 TIME: Tuesday & Friday 10:30 – 11:45 Airport Classroom
 PROF: Dr. Peter Solies

Fundamental theories, flight test techniques, and data collection and analyses for fixed wing aircraft performance. Topics: air data system calibration, takeoff and landing performance, turn performance, cruise performance, energy concepts, and aerodynamic modeling. Weekly classroom academics with approximately 4-6 flight labs.

(RE) Prerequisite(s): 503 or Aerospace Engineering 515.

Repeatability: May be repeated. Maximum 6 hours.

AE 599 Special Topics: Micro/Nano Electro Mechanical Systems/Sensors (3)
SEC. 015 CRN 29665 (Same as BME 599 007 CRN 29695 and ME 599 002 CRN 27310)
TEXT: *Foundations of MEMS*; Liu, C.; 2nd Edition; Pearson Education: New Jersey, 2010, ISBN 10: 0132497360, ISBN 13: 9780132497367.
Reference:
Marc J. Madou, *Fundamentals of Microfabrication and Nanotechnology*; 3rd Edition, CRC Press, 2011; ISBN 9780849331800.
G. Kovacs, *Micromachined Transducer Sourcebook*, McGraw-Hill, 1998.
Nadim Maluf, *An Introduction to Microelectromechanical Systems Engineering*, 2nd Edition, Artech House Publishers; 2004, ISBN 978-1-58053-590-8.
Sami Franssila; *Introduction to Microfabrication*, Wiley, 2010; ISBN 978-0-470-74983-8.
TIME: Tuesday & Thursday 2:40 – 3:55 E-110
PROF: Dr. Feng-Yuan Zhang

The lectures will cover fundamentals and elements of micro/nano-scale sensor design, fabrication, integration, and systems, including lithography, deposition, etching, thin film, surface modification, bonding, and characterization. The videos/movies will be presented to introduce the state-of-the-art fabrication process and integration. Their applications to transducers and actuators will be discussed.

AE 600 Doctoral Research/Dissertation (3-15)
SEC. 006 CRN 24289 Abedi
008 CRN 24291 Brooks
009 CRN 24292 Majdalani
010 CRN 24293 Moeller
013 CRN 24296 Schmisser
015 CRN 25792 Solies
017 CRN 24298 Vakili
018 CRN 25528 Zhang

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Registration Restriction(s): Minimum student level – graduate.

AE 601 Doctoral Research Methodology (3)
SEC. 002 CRN 29519
TEXT: TBD
TIME: TBD
PROF: Dr. Kivanc Ekici

Methods of planning and conducting original research and proposal writing.

Registration Restriction(s): Minimum student level – graduate / doctoral students.

Registration Permission: Departmental approval.

AVIATION SYSTEMS

AVSY 500 Master's Thesis (1-15)
SEC. 001 CRN 24343 Brooks
003 CRN 24344 Solies

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

AVSY 502 Registration for Use of Facilities (1-15)
SEC. 001 CRN 24347 Brooks
003 CRN 24348 Solies

Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

Credit Restriction: May not be used toward degree requirements.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

AVSY 515 Aviation Human Factors (3)

SEC. 001 CRN 30666

TEXT: *Human Factors in Aviation*; Salas; 2nd Edition 2010

TIME: Tuesday & Thursday 11:40 – 12:55 E-110

PROF: Dr. Steven Brooks

Human factors pertinent to aviation: concept of human factors, human error, fatigue, body rhythms, performances, motivation, vision and visual illusions, communication, attitudes, training and devices, displays and controls, space and layout, anthropometry, flight deck design and evaluation, aircraft cabin design and evaluation, flying qualities evaluation, and performance measurement techniques. Applied aviation systems.

AVSY 516 Aircraft Flight Controls (Same as AE 599 005 CRN 25644) (3)

SEC. 001 CRN 24354

TEXT: Nelson, Robert C; *Flight Stability and Automatic Control*; 2nd Edition 1988 or later; McGraw-Hill, NY; ISBN 0-07-046273-9

TIME: Tuesday & Friday 1:00 – 2:15 E-111

PROF: Dr. Peter Solies

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, and introduction to control theory and design of automatic controls.

AVSY 521 Experimental Flight Mechanics: Fixed Wing Performance (3)

SEC. 001 CRN 24355 (Same as AE 599 014 CRN 29663)

TEXT: *Flight Testing of Fixed Wing Aircraft*; Ralph D. Kimberlin; AIAA; First Edition; ISBN 1-56347-564-2

TIME: Tuesday & Friday
PROF: Dr. Peter Solies

10:30 – 11:45

Airport Classroom

Fundamental theories, flight test techniques, and data collection and analyses for fixed wing aircraft performance. Topics: air data system calibration, takeoff and landing performance, turn performance, cruise performance, energy concepts, and aerodynamic modeling. Weekly classroom academics with approximately 4-6 flight labs.

(RE) Prerequisite(s): 503 or Aerospace Engineering 515.

AVSY 550 Project in Aviation Systems (3)
SEC. 001 CRN 24356 Brooks
003 CRN 24357 Solies

Repeatability: May be repeated. Maximum 15 hours.

Credit Restriction: Maximum of 3 hours may be applied toward degree requirements.

Comment(s): Non-thesis aviation systems majors only.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level - graduate.

BIOMEDICAL ENGINEERING

BME 500 Master's Thesis (1-15)
SEC. 012 CRN 26404 Johnson

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

BME 518 Computational Fluids Dynamics (3)
SEC. 002 CRN 29684
TEXT: TBD
TIME: Tuesday & Thursday 10:10 – 11:25 E-110
PROF: Dr. Kivanc Ekici

Finite difference and finite volume techniques for solving compressible and incompressible fluid flow problems. Classification of partial differential equations and their discrete approximations. Explicit and Implicit techniques for solving unsteady Euler and Navier-Stokes equations including finite volume and finite difference formulations. Formulation of boundary conditions, artificial viscosity and multigrid acceleration. Stability analysis and convergence. Grid generation.

Cross-listed: (Same as Aerospace Engineering 518; Mechanical Engineering 518.)

Recommended Background: Fluid mechanics, differential equations, and compressible flows.

Registration Permission: Consent of instructor.

BME 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 24384 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber;
CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Tuesday & Friday 9:30 – 10:45 E-111
PROF: 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.

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.

Cross-listed: (Same as Chemical and Biomolecular Engineering 529; Civil Engineering 529, Electrical and Computer Engineering 529; Environmental Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529; Nuclear Engineering 529).

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

BME 590 Selected Biomedical Engineering Problems (2-6)
SEC. 001 CRN 27414 Johnson

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated. Maximum 6 hours.

Comment(s): Enrollment is limited to students in the non-thesis option.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

Registration Permission: Consent of instructor.

BME 595 Biomedical Seminar (1)
SEC. 002 CRN 26567
TEXT: None
TIME: Will be announced through email
PROF: Dr. Jacqueline Johnson

All phases of biomedical engineering, reports on current research at UTK and UTSL.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated. Maximum 20 hours.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate

BME 599 Cell and Tissue Engineering (3)
SEC. 005 CRN 26582
TEXT: TBD
TIME: Tuesday & Thursday 1:10 – 2:25 E-110
PROF: Dr. Zannatual Ferdous

This course is intended for BME undergraduates (upperclassmen) and MS students. Cell and Tissue Engineering course will address issues related to understanding cell structure-function relationships and their behavior in tissue engineered substrates. This course is intended to be a bridge between Engineers and cell biologist, since they work interchangeably in any successful biomedical design and application. Cells are an integral part of tissue engineering and for successful design of a functional tissue requires solid understanding of cell behavior in native system and their response to the external forces that include chemical factors and mechanical forces. The considerations for successful design of engineered tissue for

cardiovascular application will be very different from orthopedic application due to the inherent difference in mechanical forces observed in these two native systems. Some of the typical forces observed by cells would be shear, hydrostatic pressure, tension, torsion, flexure, and combined loads. Another important consideration for tissue engineering is the scaffold used to house the cells. Both native and synthetic scaffolds have been used, and each has specific benefits for tissue engineering application. It is therefore important to understand cellular interaction with these biomaterials used as a scaffold. Finally, stem cells have huge potential for tissue engineering application because of their potential to differentiate into any desired tissue type.

The following topics will be covered in this class:

- Basic cell biology
- Mechanics of cells
- Cardiovascular tissue engineering
- Orthopedic tissue engineering
- Stem cells and their application in tissue engineering

This course will also include a group project. The students will work in a group and present their idea on developing novel tissue engineered substrate for a particular application. The student project will be graded based on a written report and oral presentation.

BME 599 Special Topics: Thin Film Enhancement of Biomedical Devices (3)
SEC. 010 CRN 31531 (Same as AE 599 006 CRN 25419, ME 599 015 CRN 29666,
MSE 576 001 CRN 31714)
TEXT: TBD
TIME: Monday & Wednesday 1:10 – 2:25 E-110
PROF: Dr. Jackie Johnson

Overview of the fundamentals of selected thin film deposition techniques and pertinent instrumentation with an emphasis on applications to biomaterials. Structural characterization and tailoring of thin films for implant-specific applications. [Growth of thin films on biomaterial surfaces](#), the biological interface and biocompatibility. Uniformity, adhesion, cytotoxicity and bacterial reduction synergy. Application of thin films in tissue engineering and stem cell technologies.

Recommended Background: BME 474 and BME 486

Registration Permission: Consent of instructor is required if from a different background than BME.

BME 599 Special Topics: Micro/Nano Electro Mechanical Systems/Sensors (3)
SEC. 007 CRN 29695 (Same as AE 599 015 CRN 29665 and ME 599 002 CRN 27310)
TEXT: *Foundations of MEMS*; Liu, C.; 2nd Edition; Pearson Education: New Jersey, 2010, ISBN 10: 0132497360, ISBN 13: 9780132497367.
Reference:
Marc J. Madou, *Fundamentals of Microfabrication and Nanotechnology*; 3rd Edition, CRC Press, 2011; ISBN 9780849331800.
G. Kovacs, *Micromachined Transducer Sourcebook*, McGraw-Hill, 1998.
Nadim Maluf, *An Introduction to Microelectromechanical Systems Engineering*, 2nd Edition, Artech House Publishers; 2004, ISBN 978-1-58053-590-8.
Sami Franssila, *Introduction to Microfabrication*, Wiley, 2010; ISBN 978-0-470-74983-8.
TIME: Tuesday & Thursday 2:40 – 3:55 E-110
PROF: Dr. Feng-Yuan Zhang

The lectures will cover fundamentals and elements of micro/nano-scale sensor design, fabrication, integration, and systems, including lithography, deposition, etching, thin film, surface modification, bonding, and characterization. The videos/movies will be presented to introduce the state-of-the-art fabrication process and integration. Their applications to transducers and actuators will be discussed.

BME 600 Doctoral Research/Dissertation (3-15)
SEC. 011 CRN 26405 Johnson

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Registration Restriction(s): Minimum student level – graduate.

BME 601 Doctoral Research Methodology (3)
SEC. 002 CRN 29520
TEXT: TBD
TIME: TBD
PROF: Dr. Eric Boder

Intensive, individualized experience in reviewing literature, evaluating experimental or theoretical methods, planning a research project, and presenting research project plans orally and in writing.

Registration Restriction(s): Minimum student level – graduate. PhD students only.

Registration Permission: Consent of instructor.

ENGINEERING MANAGEMENT

EM 500 Master's Thesis (1-15)
SEC. 001 CRN 28080 Simonton
002 CRN 29386 Yu

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

EM 501 Capstone Project (3-6)
SEC. 001 CRN 22103 Tolk

Application-oriented project to show competence in major academic area.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated. Maximum 6 hours.

Comment(s): Requires enrollment in engineering management.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

EM 502 Registration for Use of Facilities (1-15)
SEC. 001 CRN 22104 Simonton
002 CRN 30277 Yu

Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

Credit Restriction: May not be used toward degree requirements.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

EM 533 Theory and Practice of Engineering Management (3)
SEC. 001 CRN 22105 Students participating at Tullahoma classrooms
002 CRN 22106 Students participating by distance ed.
003 CRN 22107 Students participating at Knoxville DE classrooms
TEXT: *Productive Workplaces Revisited: Dignity, Meaning and Community in the 21st Century*;
M. R. Weisbord, (2004) Pfeifer, ISBN # 0787971170
TIME: Wednesday 4:00 – 6:35 E-113
PROF: Dr. Joe Costa

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 for Engineering Managers (3)
SEC. 001 CRN 22109 Students participating at Tullahoma classrooms
002 CRN 22110 Students participating by distance ed.
003 CRN 22111 Students participating at Knoxville DE classrooms
TEXT: *Introduction to Management Accounting*, 15th Edition, C. T. Horngren, G. L. Sundem, W. Stratton, D. Burgstahler, J. Schatzberg, ISBN-13: 978-0-13-610265-6
TIME: Monday 4:00 – 6:35 E-113
PROF: Dr. Andrew Yu

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 538 New Venture Formation (3)
SEC. 001 CRN 28089 Students participating at Tullahoma classrooms
002 CRN 28090 Students participating by distance ed.
003 CRN 28091 Students participating at Knoxville DE classrooms
TEXT: *Technology Ventures: From Idea to Enterprise*, Thomas H. Byers, Richard C. Dorf, Andrew Nelson, (2011), 3rd edition, McGraw-Hill, ISBN # 13: 9780073380186
TIME: Thursday 4:00 – 6:35 E-113
PROF: Dr. James Simonton

Factors other than mechanical or chemical which enter into successful establishment of manufacturing or service enterprise. Organizational and financial planning and evaluation. Cost and location studies and market analysis to determine commercial feasibility of new ventures.

Recommended Background: Graduate standing in Engineering or Business.

EM 541 Managing Change and Improvement in Technical Organizations (3)
SEC. 001 CRN 22113 (Pre-recorded)
TEXT: *The Prince*, Niccolo Machiavelli, Anthony Grafton, George Bull, Penguin Classics, Reissue edition (Feb 4, 2003), ISBN# 0140449159
The New Economics, W. Edwards Deming, MIT Press, 2nd ed, ISBN# 9780262541169

Organizational Culture & Leadership, Edgar H. Schein, Jossey-Bass Publisher, 4th ed,
ISBN# 9780470190609

TIME: TBD

PROF: Dr. Janice Tolk

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

Recommended Background: Graduate standing in Engineering or Business.

EM 600 Doctoral Research/Dissertation (3-15)

SEC. 001 CRN 25495 Simonton

003 CRN 29398 Yu

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Registration Restriction(s): Minimum student level – graduate.

INDUSTRIAL ENGINEERING

IE 529 Applications of Linear Algebra in Engineering Systems (3)

SEC. 001 CRN 21815 (Video Recorded)

TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber;
CRC Press; Latest Edition; ISBN 978-1-4200-9523-4

TIME: Tuesday & Friday 9:30 – 10:45

E-111

PROF: 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.

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.

Cross-listed: (Same as Chemical and Biomolecular Engineering 529; Civil Engineering 529, Electrical and Computer Engineering 529; Environmental Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529; Nuclear Engineering 529).

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

MATERIAL SCIENCE ENGINEERING

MSE 576 Special Topics: Thin Film Enhancement of Biomedical Devices (3)

SEC. 001 CRN 31714 (Same as BME 599 010 CRN 31531, AE 599 006 CRN 25419,

ME 599 015 CRN 29666)

TEXT: TBD
TIME: Monday & Wednesday 1:10 – 2:25 E-110
PROF: Dr. Jackie Johnson

Overview of the fundamentals of selected thin film deposition techniques and pertinent instrumentation with an emphasis on applications to biomaterials. Structural characterization and tailoring of thin films for implant-specific applications. [Growth of thin films on biomaterial surfaces](#), the biological interface and biocompatibility. Uniformity, adhesion, cytotoxicity and bacterial reduction synergy. Application of thin films in tissue engineering and stem cell technologies.

Recommended Background: BME 474 and BME 486

Registration Permission: Consent of instructor is required if from a different background than BME.

MATHEMATICS

MECHANICAL ENGINEERING

ME	500	Master's Thesis (1-15)	
SEC.	001	CRN 21685	Abedi
	021	CRN 21705	Anusonti-Inthra
	035	CRN 28062	Brooks
	022	CRN 21706	Majdalani
	023	CRN 21707	Moeller
	024	CRN 21708	Schmisser
	025	CRN 21709	Solies
	026	CRN 21710	Vakili
	034	CRN 26048	Zhang

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

ME	502	Registration for Use of Facilities (1-15)	
SEC.	002	CRN 25554	Moeller

Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

Credit Restriction: May not be used toward degree requirements.

Credit Level Restriction: Graduate credit only.

Registration Restriction(s): Minimum student level – graduate.

ME	512	Convection Heat Transfer (3)	
SEC.	001	CRN 21721	
TEXT:	Adrian Bejan; <i>Convection Heat Transfer</i> ; 4th Edition; John Wiley		
TIME:	Monday & Wednesday	4:10 – 5:25	F-252
PROF:	Dr. Feng Yuan Zhang		

Models and equations for fluid motion, the general energy equation, and transport properties. Exact, approximate, and boundary layer solutions for laminar flow heat transfer problems. Heat transfer in internal and external forced and buoyancy driven flows. Application of similarity concepts and analogies to convection heat transfer.

Recommended Background: Undergraduate heat transfer course.

ME 518 Computational Fluid Dynamics (3)
SEC. 002 CRN 29683
TEXT: TBD
TIME: Tuesday & Thursday 10:10 – 11:25 E-110
PROF: Dr. Kivanc Ekici

Finite difference and finite volume techniques for solving compressible and incompressible fluid flow problems. Classification of partial differential equations and their discrete approximations. Explicit and Implicit techniques for solving unsteady Euler and Navier-Stokes equations including finite volume and finite difference formulations. Formulation of boundary conditions, artificial viscosity and multigrid acceleration. Stability analysis and convergence. Grid generation.

Cross-listed: (Same as Aerospace Engineering 518; Biomedical Engineering 518.)

Recommended Background: Fluid mechanics, differential equations, and compressible flows.

Registration Permission: Consent of instructor.

ME 522 Thermodynamics II (3)
SEC. 001 CRN 21723
TEXT: *Thermodynamics*; 1st Edition by Sanford Klein (Author), Gregory Nellis (Author)
ISBN-13: 978-0521195706
TIME: Monday 4:00 – 6:35 E-111
PROF: Dr. Paul Marotta

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.

Recommended Background: Undergraduate thermodynamics.

ME 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 21725 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber;
CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Tuesday & Friday 9:30 – 10:45 E-111
PROF: 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.

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.
Cross-listed: (Same as Chemical and Biomolecular Engineering 529; Civil Engineering 529, Electrical and Computer Engineering 529; Environmental Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Nuclear Engineering 529).
Comment(s): Graduate standing or consent of instructor required.

ME 585 Turbomachinery Systems II (3)
 SEC. 001 CRN 21730 (Video Recorded)
 TEXT: Jack D. Mattingly; *Elements of Propulsion: Gas Turbines and Rockets*; 2006;
 ISBN 1-56347-779-3
 TIME: Tuesday & Thursday 4:00 – 5:15 E-111
 PROF: 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.

ME 590 Selected Engineering Problems (2-6)
 SEC. 002 CRN 21731 Abedi
 011 CRN 26043 Brooks
 005 CRN 26037 Majdalani
 006 CRN 26038 Moeller
 007 CRN 26039 Schmisser
 008 CRN 26040 Solies
 009 CRN 26041 Vakili
 010 CRN 26042 Zhang

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Enrollment limited to students in problems option.
Registration Permission: Consent of advisor.

ME 595 Mechanical Engineering Seminar (1)
 SEC. 001 CRN 21732
 TEXT: None
 TIME: Will be announced through email
 PROF: Dr. Ahmad Vakili

All phases of mechanical engineering, reports on current research at the University of Tennessee, Knoxville, and the University of Tennessee Space Institute.

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 20 hours.

ME 599 Special Topics: Micro/Nano Electro Mechanical Systems/Sensors (3)
 SEC. 002 CRN 27310 (Same as AE 599 015 CRN 29665 and BME 599 007 CRN 29695)
 TEXT: *Foundations of MEMS*; Liu, C.; 2nd Edition; Pearson Education: New Jersey, 2010,
 ISBN 10: 0132497360, ISBN 13: 9780132497367.
 Reference:

Marc J. Madou, *Fundamentals of Microfabrication and Nanotechnology*; 3rd Edition, CRC Press, 2011; ISBN 9780849331800.

G. Kovacs, *Micromachined Transducer Sourcebook*, McGraw-Hill, 1998.

Nadim Maluf, *An Introduction to Microelectromechanical Systems Engineering*, 2nd Edition, Artech House Publishers; 2004, ISBN 978-1-58053-590-8.

Sami Franssila, *Introduction to Microfabrication*, Wiley, 2010; ISBN 978-0-470-74983-8.

TIME: Tuesday & Thursday 2:40 – 3:55 E-110
PROF: Dr. Feng-Yuan Zhang

The lectures will cover fundamentals and elements of micro/nano-scale sensor design, fabrication, integration, and systems, including lithography, deposition, etching, thin film, surface modification, bonding, and characterization. The videos/movies will be presented to introduce the state-of-the-art fabrication process and integration. Their applications to transducers and actuators will be discussed.

ME 599 Special Topics: Data Measurement and Analysis (3)
SEC. 005 CRN 27376 (Same as AE 599 011 CRN 28490)
TEXT: *Random Data: Analysis and Measurement Procedures*; Julius S. Bendat and Allan G. Piersol; Wiley; 4th Edition; ISBN 978-0-470-24877-5
TIME: Tuesday & Thursday 11:15 – 12:30 E-113
PROF: Dr. Phillip Kreth

Tools for random data analysis (including types of random data, mean values, mean-square values, probability density and distribution functions, moments and characteristic functions, spectral and correlation analyses); bias and random error estimates in data measurements; input-output system models; measurement examples.

ME 599 Special Topics: Combustion and Chemically Reacting Flows II (3)
SEC. 006 CRN 26323 (Same as AE 599 008 CRN 26540)
TEXT: *An Introduction to Combustion: Concepts and Applications*; 3rd Edition; Stephen Turns; ISBN-13: 978-0073380193; ISBN-10: 0073380199
Available from Amazon.com:

https://www.amazon.com/Introduction-Combustion-Concepts-Applications/dp/0073380199/ref=mt_hardcover?_encoding=UTF8&me=
TIME: Tuesday & Friday 1:00 – 2:15 E-113
PROF: Dr. Trevor Moeller

Advanced topics: phenomenological approaches to turbulent flames; fundamentals of turbulent flow; application of probability density functions to turbulent flames; turbulent reacting flows with premixed and/or non-premixed reactants; spray combustion models; fluidized bed combustion; chemically reacting boundary layer flow; gas turbine and/or rocket motor combustors; furnaces; introduction to supersonic combustion and hypersonic flows.

(DE) Prerequisite(s): 525.

ME 599 Special Topics: Thin Film Enhancement of Biomedical Devices (3)
SEC. 015 CRN 29666 (Same as AE 599 006 CRN 25419, BME 599 010 CRN 31531, MSE 576 001 CRN 31714)
TEXT: TBD
TIME: Monday & Wednesday 1:10 – 2:25 E-110
PROF: Dr. Jackie Johnson

Overview of the fundamentals of selected thin film deposition techniques and pertinent instrumentation with an emphasis on applications to biomaterials. Structural characterization and tailoring of thin films for implant-specific applications. [Growth of thin films on biomaterial surfaces](#), the biological interface and biocompatibility. Uniformity, adhesion, cytotoxicity and bacterial reduction synergy. Application of thin films in tissue engineering and stem cell technologies.

Recommended Background: BME 474 and BME 486

Registration Permission: Consent of instructor is required if from a different background than BME.

ME	600	Doctoral Research/Dissertation (3-15)	
SEC.	015	CRN 21750	Abedi
	031	CRN 28063	Brooks
	018	CRN 21753	Majdalani
	019	CRN 21754	Moeller
	027	CRN 21762	Schmisser
	028	CRN 21763	Solies
	029	CRN 26044	Vakili
	030	CRN 26045	Zhang

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Registration Restriction(s): Minimum student level – graduate.

ME	601	Doctoral Research Methodology (3)	
SEC.	002	CRN 29521	
TEXT:	TBD		
TIME:	TBD		
PROF:	Dr. Kivanc Ekici		

Methods of planning and conducting original research and proposal writing.

Registration Restriction(s): Minimum student level – doctoral student.

Registration Permission: Departmental approval.

ME	610	Advanced Topics in Thermal/Fluid Science (3)		
SEC.	008	CRN 31532		
TEXT:	TBD			
TIME:	Monday & Wednesday	11:40 – 12:55		E-110
PROF:	Dr. J. Frankel			

Advanced theory and applications in the thermal/fluid sciences.

Repeatability: May be repeated. Maximum 9 hours.

Registration Restriction(s): Minimum student level – graduate.

Registration Permission: Consent of instructor.

PHYSICS

Phys	500	Master's Thesis (1-15)	
SEC.	002	CRN 23745	Davis
	003	CRN 23746	Parigger

Grading Restriction: P/NP only.

Repeatability: May be repeated.

Credit Level Restriction: Graduate credit only.
Registration Restriction(s): Minimum student level – graduate.

Phys 599 Seminars (1)
SEC. 010 CRN 29511
TEXT: None
TIME: 2nd & 4th Thursday 3:30 – 5:00 H-111
PROF: Dr. Christian Parigger

(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 Doctoral Research/Dissertation (3-15)
SEC. 002 CRN 23773 Davis
003 CRN 23774 Parigger

Grading Restriction: P/NP only.
Repeatability: May be repeated.
Registration Restriction(s): Minimum student level – graduate.

Phys 610 Quantum Optics (3)
SEC. 001 CRN 31478
TEXT: TBD
TIME: TBD
PROF: 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.

(DE) Prerequisite(s): 521.

Registration Restriction(s): Minimum student level – graduate.

Phys 642 Adv. Top: Spatially and Temporally Resolved Spectroscopy of Laser-Induced Plasma (3)
SEC. 003 CRN 27552
TEXT: TBD
TIME: Monday & Thursday 1:00 – 2:15 E-111
PROF: Dr. Christian Parigger

Advanced theoretical or experimental topics not covered in other courses.

Repeatability: May be repeated with consent of department. Maximum 9 hours.

Registration Restriction(s): Minimum student level – graduate.