

# ***Fall 2015***

## ***Registration Announcement***



# ***The University of Tennessee***

## ***Space Institute***

*411 B.H. Goethert Parkway  
Tullahoma, TN 37388-9700  
888-822-8874 ext. 37228  
[www.utsi.edu](http://www.utsi.edu)*



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## CALENDAR - 2015 FALL SEMESTER

Priority Registration.....	March 9, 2015 – August 17, 2015
Admission to Candidacy Forms for Fall 2015 Commencement.....	August 6, 2015
Fall 2015 Graduation Application Deadline (submit online at MyUTK).....	August 6, 2015
Graduation Fee Payment Deadline (MS \$30, PhD \$75).....	August 6, 2015
Payment Due for Priority Registration.....	August 17, 2015
Late Registration and late fees begin ( <b>\$100 Late Fee</b> ).....	August 19, 2015
Classes begin.....	August 19, 2015
Last Day to final register, add, change grading options or drop without a “W”.....	August 28, 2015
Payment Due for Late Registration.....	August 28, 2015
Registration after 14 <sup>th</sup> day late fee ( <b>\$200 Late Fee</b> ).....	September 2, 2015
Labor Day.....	September 7, 2015
Preliminary Thesis/Dissertation Review Deadline ( <a href="mailto:thesis@utk.edu">thesis@utk.edu</a> ).....	October 9, 2015
Fall Break (No Classes).....	October 15 - 16, 2015
Last day to schedule final exam (non-thesis/thesis/dissertation).....	October 30, 2015
Register to attend the Graduate Hooding Ceremony ( <a href="http://gradschool.utk.edu">http://gradschool.utk.edu</a> ).....	TBD
Purchase cap and gown and order hood (865-974-3459).....	TBD
Last day to take final exam (non-thesis/thesis/dissertation).....	November 6, 2015
Drop with a “W”.....	November 10, 2015
Thesis/Dissertation Deadline 5:00 p.m. EST.....	November 20, 2015
Submit report of final examination (Pass/Fail) form.....	November 20, 2015
Thanksgiving Holidays.....	November 26 – 27, 2015
Deadline for Submission of Admission to Candidacy for students	
Graduating Spring 2016 and Graduation Application.....	November 2, 2015
All "INCOMPLETE" must be removed for Graduation.....	December 1, 2015
Classes End.....	December 1, 2015
Total Withdraw from the University Deadline.....	December 1, 2015
Study Period.....	December 2, 2015
Exam Period.....	December 3, 4 & 7, 2015
Graduate Hooding Ceremony (UTK).....	December 10, 2015
COMMENCEMENT (UTK).....	December 11, 2015
Official Graduation Date.....	December 11, 2015

### Second thesis/dissertation deadlines

Defense Completed by December 1, 2015

Second Deadline Application Submitted by December 1, 2015

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

Thesis/Dissertation Submission Deadline by January 5, 2016

(Student will receive diploma spring 2016 semester, but will not be required to register for thesis/dissertation credits)

A new graduation application must be submitted for Spring graduation. For more

Information on graduation steps see <http://gradschool.utk.edu/graduation.shtml>

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## SPRING SEMESTER 2016

Priority Registration.....	TBD
Final Registration.....	TBD
Classes Begin.....	January 13, 2016
Martin Luther King Day (Holiday).....	January 18, 2016
Spring Break.....	March 14 – 18, 2016
Spring Recess.....	March 25, 2016
Classes End.....	April 29, 2016

Study Period..... May 2, 2016  
 Exam Period..... May 3, 4, & 5, 2016  
 Graduate Hooding Ceremony (UTK) ..... May 12, 2016  
 University College Commencement Ceremonies ..... May 11 – 14, 2016  
 Official Graduation Date on Transcript ..... May 14, 2016

**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](http://registrar.tennessee.edu/academic_calendar/index.shtml)

**FALL SEMESTER 2015  
 FINAL STUDY DAY AND EXAM SCHEDULE**

LAST DAY OF CLASSES.....December 1, 2015  
 STUDY PERIOD .....December 2, 2015

**FINAL EXAMS**

REGULAR CLASS TIME (Same Classroom) EXAM TIME

1<sup>st</sup> Day – Thursday, December 3, 2015

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

2<sup>nd</sup> Day – Friday, December 4, 2015

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

3<sup>rd</sup> Day – Monday, December 7, 2015

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

\*\*\*\* ATTENTION \*\*\*\*

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

NO CLASSES WILL BE IN SESSION  
 AT THIS TIME

## **REGISTRATION ANNOUNCEMENT FALL SEMESTER 2015**

### **NEW STARTING FALL 2015 – Increase in Late Registration Fee**

Beginning Fall of 2015 a student who does not register until the first day of class (August 19, 2015) and who was eligible to register beforehand will be assessed a \$100 fee (an increase from the current \$20 fee). If the student registers after the 14th day (September 2, 2015) the fee increases to \$200. This is also applicable to students who register, are cancelled, and then re-register.

This increase is an attempt to encourage timely registration and discourage late registrations which negatively impact the university's ability to plan course offerings.

### **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](mailto: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 Admissions, 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 Admissions, 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 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 Fall Semester 2015 must remove all INCOMPLETE GRADES by **December 1, 2015**. 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 2014-2015 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 – December 2, 2015**

**FINAL EXAMS –December 3, 4, & 7, 2015**

## **FINANCIAL CALENDAR, FEES, REFUNDS, AND TUITION**

Please click [FEES](#) link to the most current information. You may also contact Jennifer Boyles in the Business and Finance Office at [jboyles@utsi.edu](mailto: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 starting Spring 2015. 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 in Student Services, D-100 or online at <http://dos.utk.edu/hilltopics/>.

**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  
Fall 2015 Course Listings**

**AEROSPACE ENGINEERING**

AE 500 Master's Thesis (1-15)  
SEC. 001 CRN 42761 Abedi  
009 CRN 42777 Anusonti-Inthra  
010 CRN 42781 Majdalani  
011 CRN 42783 Moeller  
021 CRN 42801 Schmisser  
012 CRN 42786 Solies  
013 CRN 42787 Vakili  
014 CRN 42788 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 42806 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 511 Inviscid Flow (3)  
SEC. 002 CRN 46548  
TEXT: TBD  
TIME: Tuesday & Thursday 8:40 – 9:55 E-110  
PROF: Dr. Phuriwat Anusonti-Inthra

Kinematics and dynamics of inviscid fluids; potential flow about body, conformal mapping.

*(DE) Prerequisite(s): 541 and Mathematics 425.*

AE 515 Air Vehicle Aerodynamics and Performance (3)  
SEC. 001 CRN 45542 (Video Recorded)  
TEXT: M. Asselin; *An Introduction to Aircraft Performance*; AIAA Education Series, Reston, VA  
1997; ISBN 1-75-623241-X  
TIME: Tuesday & Friday 1:00 – 2:15 E-111  
PROF: Dr. Peter Solies

Application of aerodynamics principles to air vehicles to provide estimates of performance, stability, and control characteristics for subsonic to hypersonic speeds. Relations among thrust, drag, lift and attitude, propulsion systems, vehicle performance characteristics, and trajectory optimization.

AE 521 Aerodynamics of Compressible Fluids I (3)  
SEC. 001 CRN 46327  
TEXT: John D. Anderson; *Modern Compressible Flow: With Historical Perspectives*; 3rd Edition; McGraw Hill; ISBN 0-07-242443-5.  
TIME: Monday & Wednesday 10:10 – 11:25 E-110  
PROF: Dr. John Schmisser

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

AE 533 Dynamics (3) (Cancelled)  
SEC. 002 CRN 47723  
TEXT: TBD  
TIME: Monday & Wednesday 1:10 – 2:25 E-110  
PROF: Dr. Xiaopeng Zhao

Kinematics and dynamics of particles in three dimensions. Rotating coordinate systems. Hamilton's principle. Lagrange's equations of motion. Kinematics and dynamics of rigid bodies.

*Cross-listed: (Same as Mechanical Engineering 533.)*

*Recommended Background: 391 or Mathematics 431 and an undergraduate vibrations course.*

AE 541 Fluid Mechanics I (3)  
SEC. 003 CRN 46589  
TEXT: TBD  
TIME: Monday & Wednesday 11:40 – 12:55 E-114  
PROF: Zhili Zhang

Derivation of equations governing flow of inviscid and viscous fluids (conservation of mass, Newton's second law, conservation of energy). Equations of state and constitutive relations. Euler and Navier-Stokes forms and nondimensionalization. Exact solutions and introduction to potential and boundary-layer flows.

*Cross-listed: (Same as Mechanical Engineering 541; Biomedical Engineering 541.)*

*Recommended Background: A fluid mechanics course.*

AE 557 Aerospace Vehicle Flutter and Vibration (3)  
SEC. 001 CRN 48397 (Video Recorded)  
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 581 Rocket Propulsion I (3)  
 SEC. 001 CRN 50978  
 TEXT: George P. Sutton and Oscar Biblarz, Rocket Propulsion Elements, 8th ed. Wiley.  
[http://www.amazon.com/Rocket-Propulsion-Elements-George-Sutton/dp/0470080248/ref=sr\\_1\\_1?ie=UTF8&qid=1437680444&sr=8-1&keywords=sutton+rocket+propulsion+elements](http://www.amazon.com/Rocket-Propulsion-Elements-George-Sutton/dp/0470080248/ref=sr_1_1?ie=UTF8&qid=1437680444&sr=8-1&keywords=sutton+rocket+propulsion+elements)  
 TIME: Tuesday & Friday 1:00 – 2:15 E-113  
 PROF: Dr. Trevor Moeller

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

*Registration Permission: Consent of Instructor.*

AE 590 Selected Engineering Problems (2-6)  
 SEC. 002 CRN 42814 Abedi  
 003 CRN 42815 Anusonti-Inthra  
 004 CRN 46329 Majdalani  
 005 CRN 46330 Moeller  
 009 CRN 46334 Schmisser  
 006 CRN 46331 Solies  
 007 CRN 46332 Vakili  
 008 CRN 46333 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 42818  
 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 in Aerospace Engineering: Computational Fluid Dynamics (3)  
 SEC. 001 CRN 42821 (Same as ME 599 001 CRN 43513)  
 TEXT: Handouts provided by instructor  
 TIME: Monday & Wednesday 11:40 – 12:55 E-110  
 PROF: Dr. Greg Power

This course uses a commercial CFD code that is widely accepted and used in industries and government labs as a hands-on introduction to computational fluid dynamics. After a brief review of the fundamentals, the course will cover various aspects of the simulation process including geometry modeling, grid generation, solution strategy and post processing primarily through practical examples that bring out the importance of proper understanding of the underlying physics for the problem. Examples will also attempt to cover a wide range of problems that cover different types of flow conditions

(incompressible/compressible, laminar/turbulent, steady/unsteady flows, free surface flows, flows with heat transfer and possibly reacting flows).

A personal computer with at least a 64-bit processor and 4 – 8 GB of RAM is required for this course.

*Repeatability: May be repeated. Maximum 6 hours.*

*Registration Permission: Consent of instructor.*

AE 599 Special Topics in AE: Micro/Nano Electro Mechanical Systems (3) **(Cancelled)**

SEC. 002 CRN 42822 (Same as ME 599 008 CRN 47765)

TEXT: Textbook: Liu, C. *Foundations of MEMS*, 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 10:10 – 11:25 E-110

PROF: Dr. Feng-Yuan Zhang

The lectures will cover fundamentals and elements of micro/nano-scale 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 energy systems, power/propulsion devices, biomedical applications, transducers and actuators will be discussed.

*Repeatability: May be repeated. Maximum 6 hours.*

AE 599 Special Topics in AE: Micro/Nano Manufacturing (3)

SEC. 006 CRN 49902 (Same as ME 599 010 CRN 48834)

TEXT: Provided by instructor

TIME: Tuesday & Thursday 2:40 – 3:55 E-110

PROF: Dr. Anming Hu

Fundamentals of micro-nano-manufacturing with an emphasis on the relationships between unique functions of micro-nano-materials, designed architectures, and appropriate manufacturing strategies will be discussed. This course will well blend the knowledge of nanotechnology, advanced manufacturing and additive manufacturing (3D printing). Students will conduct independent literature review research on micro-nano-manufacturing techniques they selected. The group project will be conducted in the Instructor labs.

This interactive course is designed for both undergraduate and graduate students.

Prerequisites and Co-requisites:

Basics of manufacturing sciences and mechanical engineering will be required. If in doubt, please ask instructor for approval. Number of seats will be limited to 15 for effective group projects at the Instructor's lab.

*Major: Open to all Engineering Majors [seniors and graduate students]*

*Repeatability: May be repeated. Maximum 6 hours.*

AE 600 Doctoral Research/Dissertation (3-15)  
 SEC. 004 CRN 42832 Abedi  
 005 CRN 42834 Anusonti-Inthra  
 006 CRN 42836 Majdalani  
 007 CRN 42838 Moeller  
 017 CRN 46556 Schmisser  
 008 CRN 42840 Solies  
 014 CRN 42846 Vakili  
 015 CRN 42847 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 50271  
 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.*

AE 681 Advanced Viscous Flow Theory (3)  
 SEC. 001 CRN 49936  
 TEXT: TBD; Handouts will be provided  
 TIME: Monday & Wednesday 8:40 – 9:55 E-110  
 PROF: Dr. Ahmad Vakili

Critical review of significance to governing equations. Nature of boundary layer approximation as singular perturbation problem. Uniqueness and existence of solutions. Applications of group theory. Special problem areas of interest to students.

*(DE) Prerequisite(s): 512, continuum mechanics, and Mathematics 562.*

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

## **AVIATION SYSTEMS**

AS 500 Master's Thesis (1-15)  
 SEC. 001 CRN 46335 Brooks  
 002 CRN 46336 Solies

*Grading Restriction: P/NP only.*

*Repeatability: May be repeated.*

*Credit Level Restriction: Graduate credit only.*

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

AS 502 Registration for Use of Facilities (1-15)  
 SEC. 001 CRN 46339 Brooks  
 002 CRN 46340 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.*

AS 522 Experimental Flight Mechanics: Fixed Wing Stability & Control (3)  
SEC. 001 CRN 46344  
TEXT: Ralph D. Kimberlin; *Flight Testing of Fixed Wing Aircraft*; AIAA; 1<sup>st</sup> 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 stability and control. Topics: static and dynamic longitudinal stability, longitudinal maneuvering stability and control, static and dynamic lateral-directional stability, lateral control power, and departure testing. Weekly classroom academics with approximately 4-6 flight labs.

*(DE) Prerequisite(s): 516 and 521.*

AS 550 Project in Aviation Systems (3)  
SEC. 001 CRN 46345 Brooks  
002 CRN 46346 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 47438 Johnson

*Grading Restriction: P/NP only.*

*Repeatability: May be repeated.*

*Credit Level Restriction: Graduate credit only.*

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

BME 529 Applications of Linear Algebra in Engineering Systems (3)  
SEC. 002 CRN 47558 (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-113  
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 595 Biomedical Seminar (1)  
SEC. 002 CRN 47078  
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 600 Doctoral Research/Dissertation (3-15)  
SEC. 011 CRN 47079  
*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 50272  
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.*

BME 610 Advanced Topics in BME: Magnetic Nanoparticles in Medicine (3)  
SEC. 002 CRN 46911  
TEXT: Magnetic Nanoparticles – From Fabrication to Clinical Applications; Nguyen T.K., Thanh; CRC Press; ISBN 978-1-4398-6932-1  
TIME: Tuesday and Thursday 2:40 – 3:55 F-252  
PROF: Dr. Jacqueline Johnson

Structure and Magnetism of Magnetic Nanoparticles (MNPs). Fabrication and Characterization of MNPs. *In vivo* applications of MNPs such as Hyperthermia, Cancer Therapy, Imaging and Cancer Staging. Grades will be done on synthesis (30%), characterization (30%), a presentation (10%) and paper submission (30%).

Current research topics of interest in biomedical engineering.

*Repeatability: May be repeated. Maximum 9 hours.*

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

*Registration Permission: Consent of instructor.*

## **ELECTRICAL ENGINEERING AND COMPUTER SCIENCE**

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

SEC. 002 CRN 47559 (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-113

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, 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.*

ECE 600 Doctoral Research/Dissertation (3-15)

SEC. 031 CRN 50977 Bomar

*Grading Restriction: P/NP only.*

*Repeatability: May be repeated.*

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

## **ENGINEERING MANAGEMENT**

EM 500 Master's Thesis (1-15)

SEC. 001 CRN 48654 Simonton

002 CRN 50865 Tolk (Cancelled)

003 CRN 50866 Yu

*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 43182 Simonton  
002 CRN 49605 Tolk (Cancelled)  
003 CRN 45598 Yu

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 43183 Simonton  
002 CRN 50870 Tolk (Cancelled)  
004 CRN 50871 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 532 Productivity and Quality Engineering (3)  
SEC. 001 CRN 45600 UTSI students participating at Tullahoma (Cancelled)  
002 CRN 45601 UTSI students participating elsewhere (Prerecorded – Online Only)  
003 CRN 45602 UTK students participating elsewhere (Cancelled)  
TEXT: *Improving Performance: How to Manage the White Space on the Organization Chart*; 3<sup>rd</sup> Edition; Geary A. Rummler and Alan P. Brache.  
*The Principles of Scientific Management*, Taylor, F. W. (1998, 1911). Mineola, NY: Dover Publications, Inc.  
*The New Economics for Industry, Government, Education, 2<sup>nd</sup> Edition*, Deming, W. E. (1994). Cambridge, MA: The MIT Press.  
TIME: Monday 4:00 – 6:30 E-113  
PROF: Dr. Janice Tolk

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

EM 533 Theory and Practice of Engineering Management (3)  
SEC. 001 CRN 43184 UTSI students participating at Tullahoma  
002 CRN 43185 UTSI students participating elsewhere  
003 CRN 43186 UTK students participating elsewhere  
TEXT: *Paradigms: The Business of Discovering the Future*, J. A. Barker, (1993), Harper Business Press, New York, ISBN# 10: 0887306470 13: 978-0887306471

*Productive Workplaces Revisited: Dignity, Meaning and Community in the 21st Century*,  
M. R. Weisbord, (2004) Pfeifer, ISBN # 0787971170

TIME: Wednesday 4:00 – 6:30 E-113  
PROF: Dr. James L. Simonton

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

EM 537 Analytical Methods for Engineering Managers (3)  
SEC. 001 CRN 45604 UTSI students participating at Tullahoma  
002 CRN 45605 UTSI students participating elsewhere  
003 CRN 45606 UTK students participating elsewhere  
TEXT: Operations Management; William Stevenson; McGraw-Hill; January 7, 2014; Edition 12<sup>th</sup>;  
ISBN 13:978-0078024108, ISBN 10:0078024102  
TIME: Tuesday 3:00 – 5:30 E-113  
PROF: Dr. Andrew Yu

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

*Credit Restriction: No credit for student with undergraduate degrees in industrial engineering.*

EM 539 Strategic Management in Technical Organizations (3)  
SEC. 001 CRN 45608 UTSI students participating at Tullahoma (Cancelled)  
002 CRN 45609 UTSI students participating elsewhere (Prerecorded – Online Only)  
003 CRN 45610 UTK students participating elsewhere (Cancelled)  
TEXT: *Strategic Management: Concepts & Cases*; Frank Rothaermel; 1<sup>st</sup> Edition; McGraw-Hill;  
ISBN 10:0078112737, ISBN-13: 978-0078112737  
TIME: Wednesday 1:00 – 3:30 E-113  
PROF: Dr. Janice Tolk

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

*(RE) Prerequisite(s): 533 and Industrial Engineering 518 or consent of instructor.*

EM 542 Design of Experiments for Engineering Managers (3)  
SEC. 002 CRN 50867 UTSI students participating at Tullahoma  
003 CRN 50868 UTSI students participating elsewhere  
004 CRN 50869 UTK students participating elsewhere  
TEXT: TBD  
TIME: Wednesday 1:00 – 3:30 E-113  
PROF: Dr. Andrew Yu

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

*(RE) Prerequisite(s): Industrial Engineering 516.*

EM 600 Doctoral Research/Dissertation (3-15)  
 SEC. 001 CRN 45614 Simonton  
 002 CRN 45616 Tolk (Cancelled)  
 003 CRN 49710 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. 002 CRN 47560 (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-113  
 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 529 Applications of Linear Algebra in Engineering Systems (3)  
 SEC. 002 CRN 47561 (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-113  
 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 Biomedical Engineering 529; Chemical and Biomolecular Engineering 529; Civil Engineering 529, Electrical and Computer Engineering 529; Environmental Engineering 529; Industrial Engineering 529; Nuclear Engineering 529).  
 Comment(s): Graduate standing or consent of instructor required.

## MATHEMATICS

Math 404 Applied Vector Calculus (3)  
 SEC. 001 CRN 43352  
 TEXT: *Vector Calculus*; Paul C. Matthews; Springer; ISBN-10: 3540761802;  
 ISBN-13: 978-3540761808  
 TIME: Tuesday 2:00 – 4:30 F-253  
 PROF: Dr. Jan Zijlstra

Topics from multivariable and vector calculus; line and surface integrals, divergence theorem and the theorems of Gauss and Stokes.  
 (RE) Prerequisite(s): 241 or 247.

Math 511 Methods in Applied Mathematics I (3) **(Cancelled)**  
 SEC. 001 CRN 47461  
 TEXT: *Applied Analytic Mathematics for Physical Scientists*; Cushing; Wiley; 2<sup>nd</sup> Edition.  
*Essential Mathematical Methods for the Physical Sciences*; K.F. Riley and M.P. Hobson;  
 Cambridge University Press.  
 TIME: Monday & Thursday 10:45 – 12:00 E-113  
 PROF: Dr. Horace Crater

Fundamentals and techniques associated with discrete models of physical, engineering and biological systems: difference equations, networks and graphs, optimization, and other topics.  
*Recommended Background: Courses in advanced calculus and linear algebra.*

This is a two-semester course targeted for engineering students who have taken Math 404 and 435 (vector analysis and partial differential equations) and who need additional math courses for their research or advanced courses. Math Methods (Physics 571,573(2) or Math 517-518s) is currently a two semester course with the second (573(2)) being a numerical methods course for solutions of physical problems. Below I list the math topics together with likely applications (Topics & Applications)

Topics include: Calculus of variations & Euler Lagrange equations; Vector spaces & finite difference methods for solutions of eigenvalue equations; Tensors & elastic and viscous media; Complex variable, Fourier series and transforms & the forced and damped and coupled harmonic oscillators ; Special Functions & Classical Field Theories (Plasmas, Electrodynamics and Gravity), Perturbation theory and nonperturbative methods & scattering theory; Complex variables (conformal mapping) & fluid flow and problems in potential theory; Perturbation theory and Classical Chaos, other topics to be included depending on interests.



The physics needed will be introduced as the corresponding math topics are introduced. Focus will be on the mathematics.

## MECHANICAL ENGINEERING

ME	500	Master's Thesis (1-15)	
SEC.	001	CRN 43472	Abedi
	021	CRN 43492	Anusonti-Inthra
	022	CRN 43493	Majdalani
	023	CRN 43494	Moeller
	035	CRN 46350	Schmisser
	024	CRN 43495	Solies
	025	CRN 43496	Vakili
	034	CRN 46349	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 46352	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	511	Heat Transfer I	
SEC.	001	CRN 45838	
TEXT:	Heat Conduction; 3 <sup>rd</sup> Edition; David W. Hahn, M. Necati Ozisik; ISBN 978-1-118-33285-6		
TIME:	Monday & Wednesday	4:10 – 5:25	E-110
PROF:	Dr. Feng-Yuan Zhang		

Properties of radiating surfaces. Diffuse, specular and directional interchange for gray and nongray surfaces. Interaction with other heat transfer modes. Analysis of steady-state and time-dependent with other heat transfer modes. Analysis of steady-state and time-dependent heat conduction by analytical methods.

*Recommended Background: Undergraduate heat transfer course.*

ME	521	Thermodynamics I (3)	
SEC.	002	CRN 46549	
TEXT:	TBD		
TIME:	Monday & Wednesday	2:40 – 3:55	E-110
PROF:	Dr. Joseph Wehrmeyer		

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, Schroedinger equation.

*Recommended Background: Undergraduate thermodynamics.*

ME 524 Fracture Mechanics (3)  
SEC. 001 CRN 49935  
TEXT: T. L. Anderson, *Fracture Mechanics: Fundamentals and Applications*, 3rd Edition, CRC Press, USA, 2004 (main textbook).  
TIME: Tuesday & Thursday 1:10 – 2:25 E-110  
PROF: Dr. Reza Abedi

Mechanisms of fracture and crack growth; stress analysis; crack tip plastic zone; energy principles in fracture mechanics; fatigue-crack initiation and propagation; fracture mechanic design and fatigue life prediction. Analytical, numerical, and experimental methods for determination of stress intensity factors. Current topics in fracture mechanics.

*Registration Permission: Consent of instructor.*

ME 529 Applications of Linear Algebra in Engineering Systems (3)  
SEC. 002 CRN 47562 (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-113  
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 533 Dynamics (3) (Cancelled)  
SEC. 002 CRN 47724  
TEXT: TBD  
TIME: Monday & Wednesday 1:10 – 2:25 E-110  
PROF: Dr. Xiaopeng Zhao

Kinematics and dynamics of particles in three dimensions. Rotating coordinate systems. Hamilton's principle. Lagrange's equations of motion. Kinematics and dynamics of rigid bodies.

*Cross-listed: (Same as Aerospace Engineering 533.)*

*Recommended Background: 391 or Mathematics 431 and an undergraduate vibrations course.*

ME 536 Continuum Mechanics (3)  
SEC. 001 CRN 50981  
TEXT: Course Notes  
TIME: Monday & Wednesday 10:10 – 11:25 E-114  
PROF: Dr. Reza Abedi

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

*Cross-listed: (Same as Aerospace Engineering 536.)*

*Registration Permission: Consent of instructor.*

ME 541 Fluid Mechanics I (3)  
SEC. 001 CRN 45842  
TEXT: TBD  
TIME: Monday & Wednesday 11:40 – 12:55 E-114  
PROF: Zhili Zhang

Derivation of equations governing flow of inviscid and viscous fluids (conservation of mass, Newton's second law, conservation of energy). Equations of state and constitutive relations. Euler and Navier-Stokes forms and nondimensionalization. Exact solutions and introduction to potential and boundary-layer flows.

*Cross-listed: (Same as Aerospace Engineering 541; Biomedical Engineering 541.)*

*Recommended Background: A fluid mechanics course.*

ME 584 Turbomachinery Systems I (3)  
SEC. 001 CRN 45849 (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 (3)  
SEC. 001 CRN 43509 Abedi  
002 CRN 43510 Anustonti-Inthra  
003 CRN 45855 Majdalani  
004 CRN 46353 Moeller  
008 CRN 46357 Schmisser  
005 CRN 46354 Solies  
006 CRN 46355 Vakili  
007 CRN 46356 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 43511  
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 in Mechanical Engineering: Computational Fluid Dynamics (3)  
SEC. 001 CRN 43513 (Same as AE 599 001 CRN 42821)  
TEXT: Handouts provided by instructor  
TIME: Monday & Wednesday 11:40 – 12:55 E-110  
PROF: Dr. Greg Power

This course uses a commercial CFD code that is widely accepted and used in industries and government labs as a hands-on introduction to computational fluid dynamics. After a brief review of the fundamentals, the course will cover various aspects of the simulation process including geometry modeling, grid generation, solution strategy and post processing primarily through practical examples that bring out the importance of proper understanding of the underlying physics for the problem. Examples will also attempt to cover a wide range of problems that cover different types of flow conditions (incompressible/compressible, laminar/turbulent, steady/unsteady flows, free surface flows, flows with heat transfer and possibly reacting flows).  
A personal computer with at least a 64-bit processor and 4 – 8 GB of RAM is required for this course.  
*Repeatability: May be repeated. Maximum 6 hours.*  
*Registration Permission: Consent of instructor.*

ME 599 Special Topics in ME: Micro/Nano Electro Mechanical Systems (3) (Cancelled)  
SEC. 008 CRN 47765 (Same as AE 599 002 CRN 47765)  
TEXT: Textbook: Liu, C. *Foundations of MEMS*, 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 and Thursday 10:10 – 11:25 E-110  
PROF: Dr. Feng-Yuan Zhang

The lectures will cover fundamentals and elements of micro/nano-scale 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 energy systems, power/propulsion devices, biomedical applications, transducers and actuators will be discussed.

*Repeatability: May be repeated. Maximum 6 hours.*

*Registration Permission: Consent of instructor.*

ME 599 Special Topics in ME: Micro/Nano Manufacturing (3)  
SEC. 010 CRN 48834 (Same as AE 599 006 CRN 49902)  
TEXT: Provided by instructor  
TIME: Tuesday & Thursday 2:40 – 3:55 E-110  
PROF: Dr. Anming Hu

Fundamentals of micro-nano-manufacturing with an emphasis on the relationships between unique functions of micro-nano-materials, designed architectures, and appropriate manufacturing strategies will be discussed. This course will well blend the knowledge of nanotechnology, advanced manufacturing and additive manufacturing (3D printing). Students will conduct independent literature review research on micro-nano-manufacturing techniques they selected. The group project will be conducted in the Instructor labs.

This interactive course is designed for both undergraduate and graduate students.

Prerequisites and Co-requisites:

Basics of manufacturing sciences and mechanical engineering will be required. If in doubt, please ask instructor for approval. Number of seats will be limited to 15 for effective group projects at the Instructor's lab.

*Major: Open to all Engineering Majors [seniors and graduate students]*

*Repeatability: May be repeated. Maximum 6 hours.*

ME 600 Doctoral Research/Dissertation (3-15)  
SEC. 015 CRN 43530 Abedi  
016 CRN 43531 Anusonti-Inthra  
018 CRN 43533 Majdalani  
019 CRN 43534 Moeller  
029 CRN 48400 Schmisser  
026 CRN 43541 Solies  
027 CRN 43542 Vakili  
028 CRN 43543 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 50980  
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 613 Advanced Radiation Heat Transfer (3)  
SEC. 001 CRN 48461  
TEXT: *Thermal Radiation Heat Transfer*; Robert Siegel and John R. Howell; Publisher: Taylor and Francis; Edition 3<sup>rd</sup> or 4<sup>th</sup>; ISBN #: 1-56032-839-8  
Supplemental Text: Maher I. Boulos, Pierre Fauchais, and Emil Pfender, *Thermal Plasmas: Fundamentals and Applications*, Vol. 1, Plenum Press, ISBN 0-306-44607-3  
TIME: Monday & Thursday 1:00 – 2:15 E-113  
PROF: Dr. Trevor Moeller

Radiation heat transfer in absorbing, emitting and scattering media; interaction of thermal radiation with conduction and convection heat transfer.  
*(DE) Prerequisite(s): 511 and 512.*  
*Registration Restriction(s): Minimum student level – graduate.*

## PHYSICS

Phys 500 Master's Thesis (1-15)  
SEC. 002 CRN 41927 Davis  
003 CRN 42007 Parigger

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

Phys 503 Physics Colloquium (1)  
SEC. 002 CRN 42017  
TEXT: None  
TIME: TBD  
PROF: Dr. Lloyd Davis  
CLA Conference Room

Lectures and discussion on current research topics. Continuous registration required for current graduate students.  
*Grading Restriction: Satisfactory/No Credit grading only.*  
*Repeatability: May be repeated. Maximum 6 hours.*

Phys 599 Seminars (1)  
SEC. 005 CRN 42051  
TEXT: Classic Texts and Literature  
TIME: 2<sup>nd</sup>, 4<sup>th</sup> Thursday /each month 3:00 - 4:30  
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 42055 Davis  
003 CRN 42056 Parigger

*Grading Restriction: P/NP only.*

*Repeatability: May be repeated.*

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

Phys 601 Atomic Physics (3)

SEC. 002 CRN 50797

TEXT: B. Bransden and C. Joachain; Physics of Atoms and Molecules; 2nd Edition (2003); Prentice Hall; ISBN 978-0-582-35692-4; and current topics /literature;

TIME: Monday & Thursday 1:00 – 2:15 E-111

PROF: Dr. Christian Parigger

Survey of research problems and methods. Topics of current interest.

*Comment(s): Intended for all graduate students.*

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

Phys 610 Quantum Optics (3)

SEC. 002 CRN 50897

TEXT: TBD

TIME: Tuesday & Thursday 10:10 – 11:25 E-111

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.*