

# *Fall 2017*

## *Registration Announcement*



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## *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 - 2017 FALL SEMESTER

Priority Registration.....	March 20, 2017 – August 22, 2017
Admission to Candidacy Forms for Fall 2017 Commencement.....	August 11, 2017
Fall 2016 Graduation Application Deadline (submit online at MyUTK).....	August 11, 2017
Graduation Fee Payment Deadline (MS \$30, PhD \$75).....	August 11, 2017
Payment Due for Priority Registration.....	August 21, 2017
Late Registration and late fees begin ( <b>\$100 Late Fee</b> ).....	August 23- September 5, 2017
Classes begin.....	August 23, 2017
Last Day to final register, add, change grading options or drop without a “W”..	September 1, 2017
Payment Due for Late Registration.....	September 1, 2017
Registration after 14 <sup>th</sup> day late fee ( <b>\$200 Late Fee</b> ).....	September 6, 2017-End of Term
Labor Day .....	September 4, 2017
Preliminary Thesis/Dissertation Review Deadline ( <a href="mailto:thesis@utk.edu">thesis@utk.edu</a> ).....	October 6, 2017
Fall Break (No Classes) .....	October 5 - 6, 2017
Last day to schedule final exam (non-thesis/thesis/dissertation) .....	October 27, 2017
Register to attend the Graduate Hooding Ceremony ( <a href="http://gradschool.utk.edu/graduation/">http://gradschool.utk.edu/graduation/</a> ) ..	TBD
Purchase cap and gown and order hood (865-974-3459) .....	TBD
Last day to take final exam (non-thesis/thesis/dissertation) .....	November 3, 2017
Drop with a “W” .....	November 14, 2017
Thesis/Dissertation Deadline 5:00 p.m. EST .....	November 17, 2017
Submit report of final examination (Pass/Fail) form .....	November 17, 2017
Thanksgiving Holidays .....	November 23 – 24, 2017
Deadline for Submission of Admission to Candidacy for students	
Graduating Spring 2018 and Graduation Application .....	December 5, 2017
All "INCOMPLETE" must be removed for Graduation.....	December 5, 2017
Classes End.....	December 5, 2017
Total Withdraw from the University Deadline .....	December 5, 2017
Study Day .....	December 6, 2017
Final Exam Period .....	December 7, 8 & 11, 2017
Graduate Hooding Ceremony (UTK) .....	December 14, 2017
COMMENCEMENT (UTK) .....	December 15, 2017
Official Graduation Date.....	December 16, 2017

### Second thesis/dissertation deadlines

Defense Completed by December 5, 2017

Second Deadline Application Submitted by December 5, 2017

<http://gradschool.utk.edu/forms-central/>

Thesis/Dissertation Submission Deadline by January 5, 2018

(Student will receive diploma spring 2018 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 2018

Priority Registration.....	TBD
Final Registration .....	TBD
Classes Begin.....	January 10, 2018
Martin Luther King Day (Holiday).....	January 15, 2018
Spring Break .....	March 12 – 16, 2018
Spring Recess.....	March 30, 2018
Classes End.....	April 27, 2018

Study Day .....April 30, 2018  
 Exam Period.....May1, 2, & 3, 2018  
 Graduate Hooding Ceremony (UTK) ..... May 10, 2018  
 University College Commencement Ceremonies ..... May 10 – 12, 2018  
 Official Graduation Date on Transcript ..... May 12, 2018

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

[http://registrar.tennessee.edu/academic\\_calendar/index.shtml](http://registrar.tennessee.edu/academic_calendar/index.shtml)

**FALL SEMESTER 2017  
 STUDY PERIOD AND FINAL EXAM SCHEDULE**

LAST DAY OF CLASSES.....December 5, 2017

STUDY DAY .....December 6, 2017

**FINAL EXAMS**

REGULAR CLASS TIME (Same Classroom) EXAM TIME

1<sup>st</sup> Day – Thursday, December 7, 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

2<sup>nd</sup> Day – Friday, December 8, 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

3<sup>rd</sup> Day – Monday, December 11, 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 FALL 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 D-100, 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)-37234  
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 to the Graduate School of the University of Tennessee, Knoxville (UTK) is on file in the Registrar's Office. An Application for Admission to the UTK Graduate School must be completed online at <https://www.applyweb.com/utg> and accompanied by a \$60.00 non-refundable application fee made 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

three letters of recommendation when applying. International applicants will also need to include TOEFL scores. GRE scores are a requirement of all departments at UTSI except the Master of Science degree in Industrial Engineering/Engineering Management concentration. Please select UT Space Institute if you plan to attend the Tullahoma campus location. All applications need to be submitted online to the office of Graduate Admissions Knoxville, TN.

Graduate Research Assistantship applications need to be submitted to Clara Ferguson, Office of Admissions and Recruiting, University of Tennessee Space Institute, MS-6, Tullahoma, TN 37388-9700. Assistantship applications must include GRE test scores and three letters of recommendation. All International applicants will need to provide TOEFL test scores in addition to GRE's. Official transcripts and test scores should be sent to College Code 1843, Graduate Admissions Office, 201 Student Services Building, Knoxville, TN 37996-0221. Once admitted, a full admission will not be granted until all official test scores and degree confirmation are received in the Graduate Admissions Office in Knoxville. Please contact Clara Ferguson at (931) 393-7234 or 888-822-8874 ext. 37234 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 D-100, (931) 393-7228.

### **GRADUATE STUDENTS CHANGE OF REGISTRATION AFTER THE DEADLINE**

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

### **FULL-TIME STUDENTS**

Students enrolled in at least 9 semester hours during the Fall/Spring/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 Fall Semester 2017 must remove all INCOMPLETE GRADES by December 5, 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 2017-2018 academic year is provided by United HealthCare Student Resources. The premium must be paid before registration. Contact the Student Services 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 Day – December 6, 2017  
Final Exams – December 7, 8, & 11, 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](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. 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  
Fall 2017 Course Listings**

**AEROSPACE ENGINEERING**

AE 500 Master's Thesis (1-15)  
SEC. 001 CRN 42622 Abedi  
009 CRN 42638 Brooks  
010 CRN 42642 Moeller  
011 CRN 42644 Schmisser  
012 CRN 42647 Solies  
013 CRN 42648 Vakili  
014 CRN 42649 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 42667 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 46062  
TEXT: TBD  
TIME: Monday & Wednesday 10:10 – 11:25 E-110  
PROF: Dr. Ahmad Vakili

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 45152 (Same as AS 503 001 CRN 46835)  
TEXT: M. Asselin; *An Introduction to Aircraft Performance*; AIAA Education Series, Reston, VA  
1997; 1<sup>st</sup> Edition; ISBN 1-56347-221-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 517 Finite Elements for Engineering Applications (3)  
SEC. 001 CRN 50700 (Same as ME 517 001 CRN 50674)  
TEXT: Notes will be provided. Recommended books:  
K. J. Bathe; *Finite Element Procedures*. Cambridge, MA: Klaus-Jurgen Bathe, 2007.  
ISBN: 9780979004902  
T. J. R. Hughes; *The Finite Element Method: Linear Static and Dynamic Finite Element Analysis*, Dover Publications, 2000. ISBN: 978-0486411811  
TIME: Tuesday & Thursday 10:10 – 11:25 E-110  
PROF: Dr. Reza Abedi

Modern computational theory applied to conservation principles across the engineering sciences. Weak forms, extremization, boundary conditions, discrete implementation via finite element, finite difference, finite volume methods. Asymptotic error estimates, accuracy, convergence, stability. Linear problem applications in 1, 2 and 3 dimensions, extensions to non-linearity, non-smooth data, unsteady, spectral analysis techniques, coupled equation systems. Computer projects in heat transfer, structural mechanics, mechanical vibrations, fluid mechanics, heat/mass transport.

*Cross-listed: (Same as Mechanical Engineering 517)*

*Comment(s): Bachelor's degree in engineering or natural science required.*

*Registration Permission: Consent of instructor.*

AE 521 Aerodynamics of Compressible Fluids I (3)  
SEC. 001 CRN 45863  
TEXT: John D. Anderson; *Modern Compressible Flow: With Historical Perspectives*; 3rd Edition; McGraw Hill; ISBN 0-07-242443-5.  
TIME: Monday & Wednesday 8:40 – 9:55 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 536 Continuum Mechanics (3)  
SEC. 001 CRN 51929 (Same as ME 536 001 CRN 49773)  
TEXT: Course Notes  
TIME: Tuesday & Thursday 8:40 – 9:55 E-110  
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 Mechanical Engineering 536.)*

*Registration Permission: Consent of instructor.*

AE 581 Rocket Propulsion I (3)  
SEC. 001 CRN 49770  
TEXT: George P. Sutton; *Rocket Propulsion Elements*, 9<sup>th</sup> ed. Wiley; ISBN 9781118753651  
TIME: Tuesday & Friday 1:00 – 2:15 E-113  
PROF: Dr. Robert Hiers

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 42675 Abedi  
003 CRN 42676 Brooks  
004 CRN 45865 Moeller  
005 CRN 45866 Schmissieur  
006 CRN 45867 Solies  
007 CRN 45868 Vakili  
008 CRN 45869 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 42679  
TEXT: None  
TIME: Will be announced through email  
PROF: Dr. Trevor Moeller

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 I (3)  
SEC. 001 CRN 42682 (Same as ME 599 001 CRN 43369)  
TEXT: *Applied Computational Aerodynamics: A Modern Engineering Approach*; Russell M. Cummings, William H. Mason, Scot A Morton, David R. McDaniel  
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).

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

AE 600 Doctoral Research/Dissertation (3-15)  
SEC. 004 CRN 42693 Abedi  
005 CRN 42695 Brooks  
006 CRN 42697 Moeller  
007 CRN 42699 Schmissieur

008 CRN 42701 Solies  
014 CRN 42707 Vakili  
015 CRN 42708 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 49204  
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**

AS 500 Master's Thesis (1-15)  
SEC. 001 CRN 45871 Brooks  
002 CRN 45872 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 45875 Brooks  
002 CRN 45876 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 503 Air Vehicle (Same as AE 515 001 CRN 45152) (3)  
SEC. 001 CRN 46835  
TEXT: M. Asselin; *An Introduction to Aircraft Performance*; AIAA Education Series, Reston, VA  
1997; 1<sup>st</sup> Edition; ISBN 1-56347-221-X  
TIME: Tuesday & Friday 1:00 – 2:15 E-111  
PROF: Dr. Peter Solies

Focuses on the study of air vehicles as they evolved to enable human flight or unmanned flight missions. In a historical review the development of aviation technology, mission requirements, and economical aspects are emphasized. Fundamentals of aerodynamic principles and their application to air vehicles will

be developed to determine performance in level flight, climb, glide and maneuvering flight, as well as characteristic parameters as range and endurance. The state of the art of present air vehicles is investigated, as well as current problems in aviation and possible solutions. A technology forecast will be offered.

AS 522 Experimental Flight Mechanics: Fixed Wing Stability & Control (3)  
SEC. 001 CRN 45880  
TEXT: Ralph D. Kimberlin; *Flight Testing of Fixed Wing Aircraft*; AIAA; 1<sup>st</sup> Edition, 2003;  
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 45881 Brooks  
002 CRN 45882 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 46845 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 46935 (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 574 Medical Imaging (3)  
SEC. 002 CRN 51773  
TEXT: TBD  
TIME: Tuesday & Thursday 1:10 – 2:25 E-110  
PROF: Dr. Jindong Tan

Introduction is provided of the basic principles of image acquisition, formation, and processing, along with clinical applications of different imaging modalities for predicting disease outcome and treatment evaluation. Clinical site visits provide experience with imaging modalities covered in class.  
*(DE) Prerequisite(s): 503.*

BME 595 Biomedical Seminar (1)  
SEC. 002 CRN 46522  
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 46523 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 49205  
TEXT: TBD  
TIME: TBD  
PROF: Dr. Jeffrey Reinbolt

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: Recent Discoveries in Biomedical Engineering (3)  
SEC. 002 CRN 46370  
TEXT: N/A  
TIME: Monday & Wednesday 1:10 – 2:25 E-110  
PROF: Dr. Jackie Johnson

Each week, the class will study and summarize a very recently published biomedical engineering, peer-reviewed article. One student each week will present on the article then the class will discuss the article and how it applies to improving quality of life. Grades will be derived from summaries (5% for 15 summaries = 75%), discussion participation (10%) and presentation (15%).

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.*

## ENGINEERING MANAGEMENT

EM 500 Master's Thesis (1-15)  
SEC. 001 CRN 47874 Simonton  
002 CRN 49671 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 43039 Simonton  
002 CRN 48653 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 43040 Simonton  
002 CRN 49676 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 45208 (Prerecorded)



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: TBD

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 theories and systems which promote or inhibit productivity or quality improvements.

EM 537 Analytical Methods for Engineering Managers (3)  
SEC. 001 CRN 45212 UTSI students participating at Tullahoma  
002 CRN 45213 UTSI students participating elsewhere  
003 CRN 45214 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 4:00 – 6:35 E-113

PROF: Dr. Denise Jackson

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 45216 (Prerecorded)

TEXT: *Strategic Management: Concepts & Cases*; Frank Rothaermel; 3<sup>rd</sup> Edition; McGraw-Hill; ISBN - 13: 978-1259420474, ISBN-10: 1259420477

TIME: TBD

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.

*Recommended Background: Graduate standing in Engineering or Business.*

EM 542 Design of Experiments for Engineering Managers (3)

SEC. 001 CRN 49365 UTSI students participating at Tullahoma

002 CRN 49673 UTSI students participating elsewhere

003 CRN 49674 UTK students participating elsewhere

TEXT: *Design and Analysis of Experiments*; Douglas C. Montgomery; 8<sup>th</sup> Edition; John Wiley & Sons; ISBN 13:978-1118146927; ISBN 10: 1118146921

TIME: Tuesday 10:00 – 12:30 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 543 Legal and Ethical Aspects of Engineering Management (3)  
SEC. 001 CRN 51755 UTSI students participating at Tullahoma  
002 CRN 51762 UTSI students participating elsewhere  
003 CRN 51763 UTK students participating elsewhere  
TEXT: *Engineering Ethics: Concepts and Cases*, Jr. Charles E. Harris and Michael S. Pritchard  
Wadsworth Publishing, 5th ed (January 9, 2013)  
ISBN-10: 1133934694 ISBN-13: 978-1133934684  
Optional Text: *Legal Aspects of Managing Technology*, Lee B. Burgunder, West Legal Studies  
in Business Academic, South-Western College/West; 5 edition (January 20, 2010)  
ISBN-10: 1439079811 ISBN-13: 978-1439079812  
TIME: Monday 4:00 – 6:35 E-113  
PROF: Dr. Joe Costa

Legal aspects imposed by government and ethical considerations in engineering practice. Selected readings, lecture, discussion, and student presentations. Current topics from government and industry.

EM 600 Doctoral Research/Dissertation (3-15)  
SEC. 001 CRN 45222 Simonton  
002 CRN 45224 Yu

*Grading Restriction: P/NP only.*

*Repeatability: May be repeated.*

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

EM 601 Systems Theory and Engineering (3)  
SEC. 001 CRN 51781 UTSI students participating at Tullahoma  
002 CRN 51782 UTSI students participating elsewhere  
003 CRN 51783 UTK students participating elsewhere  
TEXT: *Systems Engineering and Analysis*; Benjamin Blachard and Wolter Fabrycky; 5<sup>th</sup> Edition;  
ISBN 13: 9780132217354  
TIME: Thursday 4:00 – 6:35 E-113  
PROF: Dr. James Simonton

Technology course that will examine theoretical foundations of General System Theory applied to engineering and organizational enterprises addressing issues concerning systems, the effectiveness of organizations in the context of traditional management related issues, as well as incorporating the critical impact of systems thinking on the socio-technical environment. Among the topics to be covered in the course are: the meaning of General Systems Theory (GST); GST and the unity of science; the concept of Equifinality; the characteristics and modeling of open systems; the concepts of the Learning Organization; the principle of Leverage; building Learning Organizations; and issues related to Socio-Technical Systems. Systems Engineering focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem including operations, performance, test, manufacturing, cost, and schedule. This subject emphasizes the links of systems engineering to fundamentals of decision theory, statistics, and optimization.

(RE) Prerequisite(s): 533.

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

## INDUSTRIAL ENGINEERING

IE 529 Applications of Linear Algebra in Engineering Systems (3)  
SEC. 002 CRN 46937 (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.*

## MATHEMATICS

Math 578 Numerical Methods for Partial Differential Equations (3)  
SEC. 002 CRN 51966  
TEXT: Handouts  
TIME: Tuesday & Thursday 4:00 – 5:30 E-114  
PROF: Dr. Vasikios Alexiades

Numerical approximation of solutions of partial differential equations including conservation laws and hyperbolic, parabolic, and elliptic problems. Derivation, physical meaning, and implementation of schemes.  
*Recommended Background: A course in partial differential equations or 512 or 515, and familiarity with an operating system and a programming language.*

## MECHANICAL ENGINEERING

ME 500 Master's Thesis (1-15)  
SEC. 021 CRN 43348 Abedi  
022 CRN 43349 Brooks  
023 CRN 43350 Moeller  
024 CRN 43351 Schmisser  
025 CRN 43352 Solies

034 CRN 45885 Vakili  
035 CRN 45886 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 45888 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 Fundamentals of Heat Conduction (3)  
SEC. 001 CRN 45434  
TEXT: *Heat Conduction*; 3<sup>rd</sup> Edition; David W. Hahn, M. Necati Ozisik; ISBN 978-1-118-33285-6  
TIME: Monday & Wednesday 2:40 – 3:55 E-110 (no connection)  
PROF: Dr. Feng-Yuan Zhang

Physical and mathematical formulations for Fourier heat conduction problems for lumped systems, transient and steady-state distributed systems. Solutions by separation of variables, generalized integral transforms (Fourier and Laplace) for finite and infinite domains, Green's function method, and perturbation methods for nonlinear systems.

*Recommended Background: Undergraduate heat transfer course.*

ME 517 Finite Elements for Engineering Applications (3)  
SEC. 001 CRN 50674 (Same as AE 517 001 CRN 50700)  
TEXT: Notes will be provided. Recommended books:  
K. J. Bathe; *Finite Element Procedures*. Cambridge, MA: Klaus-Jurgen Bathe, 2007.  
ISBN: 9780979004902  
T. J. R. Hughes; *The Finite Element Method: Linear Static and Dynamic Finite Element Analysis*, Dover Publications, 2000. ISBN: 978-0486411811  
TIME: Tuesday & Thursday 10:10 – 11:25 E-110  
PROF: Dr. Reza Abedi

Modern computational theory applied to conservation principles across the engineering sciences. Weak forms, extremization, boundary conditions, discrete implementation via finite element, finite difference, finite volume methods. Asymptotic error estimates, accuracy, convergence, stability. Linear problem applications in 1, 2 and 3 dimensions, extensions to non-linearity, non-smooth data, unsteady, spectral analysis techniques, coupled equation systems. Computer projects in heat transfer, structural mechanics, mechanical vibrations, fluid mechanics, heat/mass transport.

*Cross-listed: (Same as Aerospace Engineering 517.)*

*Comment(s): Bachelor's degree in engineering or natural science required.*

*Registration Permission: Consent of instructor.*

ME 529 Applications of Linear Algebra in Engineering Systems (3)  
 SEC. 002 CRN 46939 (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 536 Continuum Mechanics (3)  
 SEC. 001 CRN 49773 (Same as AE 536 001 CRN 51929)  
 TEXT: Course Notes  
 TIME: Tuesday & Thursday 8:40 – 9:55 E-110  
 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 590 Selected Engineering Problems (2-6)  
 SEC. 001 CRN 43365 Abedi  
 002 CRN 43366 Brooks  
 003 CRN 45449 Moeller  
 004 CRN 45889 Schmisser  
 005 CRN 45890 Solies  
 006 CRN 45891 Vakili  
 007 CRN 45892 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 43367  
TEXT: None  
TIME: Will be announced through email  
PROF: Dr. Trevor Moeller

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 Aerospace Engineering: Computational Fluid Dynamics I (3)  
SEC. 001 CRN 43369 (Same as AE 599 001 CRN 42682)  
TEXT: *Applied Computational Aerodynamics: A Modern Engineering Approach*; Russell M. Cummings, William H. Mason, Scot A Morton, David R. McDaniel  
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).  
*Repeatability: May be repeated. Maximum 6 hours.*  
*Registration Permission: Consent of instructor.*

ME 599 Special Topics in ME: Gas Turbine Engine Modeling and Simulation Techniques (3)  
SEC. 003 CRN 48003  
TEXT: *Elements of Gas Turbine Engine Propulsion*; J. Mattingly; ISBN 1-56347-778-5; and instructor notes.  
TIME: Tuesday & Thursday 4:00 – 5:15 E-111  
PROF: Dr. Milt Davis

This course will concentrate on numerical simulation of gas turbine engines and their components. The student will be exposed to gas turbine simulation technology for engine performance – how a cycle code is constructed, what assumptions are inherent in cycle codes, and how cycle codes are typically used in design, testing and evaluation and by the end user. A majority of the course will deal with engine cycle codes such as PERF, PARA, GASTURB and GECAT will be studied and utilized. Students will be exposed to compression system codes for both performance and operability issues. Students will be expected to become proficient in the use of cycle codes and the interpretation of the results.  
*Repeatability: May be repeated. Maximum 6 hours.*  
*Registration Permission: Consent of instructor.*

ME 600 Doctoral Research/Dissertation (3-15)  
SEC. 015 CRN 43386 Abedi  
016 CRN 43387 Brooks  
018 CRN 43389 Moeller  
019 CRN 43390 Schmisser

026 CRN 43397 Solies  
 027 CRN 43398 Vakili  
 028 CRN 43399 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 49772  
 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 47703  
 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 41887 Davis  
 003 CRN 41966 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. 009 CRN 48699  
 TEXT: Classic Texts and Literature  
 TIME: 2<sup>nd</sup>, 4<sup>th</sup> Thursday /each month 3:00 - 4:30 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 42013 Davis

003 CRN 42014 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 49611

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: Thursday 1:00 – 3:30 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 606 Nonlinear Optics (3)

SEC. 001 CRN 51876

TEXT: <http://www.amazon.com/Nonlinear-Optics-Third-Edition-Robert/dp/0123694701>

TIME: TBD

PROF: Dr. Lloyd Davis

Nonlinear optical susceptibilities, wave propagation in nonlinear media, sum-frequency and difference frequency generation, harmonic generation, parametric amplification and oscillation, stimulated Raman processes, two- and multi-photon processes, four-wave mixing and phase conjugation, transient coherent optical effects and free induction decay, optical breakdown and nonlinear effects in plasmas.

*(DE) Prerequisite(s): 522.*

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