Fall 2020
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
# TABLE OF CONTENTS

Calendar Fall Semester 2020 ........................................................................................................... 1
Study Period and Final Exam Schedule........................................................................................... 2
Registration Procedure..................................................................................................................... 3
Toll-Free Numbers........................................................................................................................... 3
Application for Admission............................................................................................................... 3
Total Withdrawal from the University............................................................................................. 4
Grades .............................................................................................................................................. 4
Graduate Student Change of Registration after the Deadline.......................................................... 4
Full-Time Students........................................................................................................................... 4
Removal of “Incomplete” Grade ....................................................................................................... 4
Repeating a Course .......................................................................................................................... 5
Admission to Candidacy (MS and PhD) ........................................................................................... 5
Continuous Enrollment ................................................................................................................... 5
Consequences of Non-Enrollment without Leave of Absence ....................................................... 6
Final Exam for Non-Thesis/Thesis/Dissertation .............................................................................. 6
UT Policy on Insurance for International Students .......................................................................... 6
General Seminar .............................................................................................................................. 6
Final Exam Dates ............................................................................................................................. 6
Financial Calendar, Fees, Refunds and Tuition ............................................................................... 6
Honor Statement ............................................................................................................................... 7
The University of Tennessee Policy on a Drug-Free Campus and Workplace............................... 7
Fall Semester 2020 Course Listings & Descriptions ....................................................................... 8
CALENDAR - 2020 FALL SEMESTER

Academic Calendar Dates are Subject to Change

Priority Registration.......................................................................................... March 9, 2020 – August 18, 2020
Admission to Candidacy Forms for Fall 2020 Commencement.............................. August 14, 2020
Fall 2020 Graduation Application Deadline (submit online at MyUTK).................. August 14, 2020
Graduation Fee Payment Deadline (MS $30, PhD $75).......................................... August 14, 2020
Payment Due for Priority Registration.................................................................. TBD
Late Registration and late fees ($100 Late Fee)....................................................... August 19 - September 1, 2020
Classes begin ........................................................................................................ August 19, 2020
Last Day to final register, add, change grading options or drop without a “W”........... TBD
Payment Due for Late Registration....................................................................... TBD
Labor Day (classes will be held) ........................................................................... September 7, 2020
Late Registration after 14th day ($200 Late Fee).................................................. September 3, 2020 - Forward
Preliminary Thesis/Dissertation Review Deadline (thesis@utk.edu)....................... September 30, 2020
Fall Break (No Classes) ...................................................................................... TBD
Last day to schedule final exam (non-thesis/thesis/dissertation)......................... October 30, 2020
Register to attend the Graduate Hooding Ceremony (http://gradschool.utk.edu/graduation/) .... TBD
Purchase cap and gown and order hood (865-974-3459)............................................. TBD
Last day to take final exam (non-thesis/thesis/dissertation)..................................... November 13, 2020
Drop with a “W” ................................................................................................... TBD
Thesis/Dissertation Deadline 5:00 p.m. EST .......................................................... November 23, 2020
Submit report of final examination (Pass/Fail) form ............................................. November 23, 2020
Classes End ......................................................................................................... November 24, 2020
No Class Day ...................................................................................................... November 25, 2020
Thanksgiving Holidays ....................................................................................... November 26 – 27, 2020
All "INCOMPLETE" must be removed for Graduation .......................................... November 30, 2020
Deadline for Submission of Admission to Candidacy for students
Graduating Spring 2021 and Graduation Application ........................................... TBD
Total Withdraw from the University Deadline ..................................................... TBD
Study Day ............................................................................................................ November 30 – December 1, 2020
Final Exam Period (fully online) ......................................................................... December 2, 3 & 4, 2020
Graduate Hooding Ceremony (UTK) .................................................................... TBD
COMMENCEMENT (UTK) ................................................................................... TBD
Official Graduation Date ..................................................................................... December 12, 2020

Second thesis/dissertation deadlines
Defense Completed by November 30, 2020
Second Deadline Application Submitted by November 30, 2020
http://gradschool.utk.edu/forms-central/
Thesis/Dissertation Submitted and Accepted by January 5, 2021 5:00 p.m. EST
(Student will receive diploma spring 2021 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

SPRING SEMESTER 2021

Priority Registration.............................................................................................. TBD
Final Registration .................................................................................................. TBD
Classes Begin....................................................................................................... January 13, 2021
Martin Luther King Day (Holiday) ...................................................................... January 18, 2021
Spring Break ..................................................................................................... March 15 – 19, 2021
No Class Day .................................................................................................. April 1, 2021
Spring Recess ................................................................................................. April 2, 2021
Classes End .................................................................................................... April 30, 2021
Study Day ....................................................................................................... May 3, 2021
Exam Period .................................................................................................... May 4, 5 & 6, 2021
Graduate Hooding Ceremony (UTK) ................................................................. May 13, 2021
University College Commencement Ceremonies ......................................... May 13 – 15, 2021
Official Graduation Date on Transcript ......................................................... May 15, 2021

Dates may be revised without notice. Please refer to the following sites for updates:
http://registrar.tennessee.edu/academic_calendar/index.shtml

FALL SEMESTER 2020
STUDY PERIOD AND FINAL EXAM SCHEDULE

LAST DAY OF CLASSES ............................................................................. November 24, 2020
STUDY DAY .................................................................................................. November 30 & December 1, 2020

ONLINE FINAL EXAMS

REGULAR CLASS TIME                EXAM TIME

1st Day – Wednesday, December 2, 2020

<table>
<thead>
<tr>
<th>Class Time</th>
<th>Monday/Thursday</th>
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<tbody>
<tr>
<td>7:45 - 9:00</td>
<td>M/Th</td>
<td>7:45 - 9:45</td>
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<tr>
<td>10:45 - 12:00</td>
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<td>9:15 - 10:30</td>
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<td>1:00 - 3:00</td>
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<tr>
<td>2:30 - 3:45</td>
<td>M/Th</td>
<td>3:30 - 5:30</td>
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2nd Day – Thursday, December 3, 2020

<table>
<thead>
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<th>Class Time</th>
<th>Tuesday/Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:15 - 10:30</td>
<td>Tu/Fri</td>
<td>7:45 - 9:45</td>
<td>Tu/Fri</td>
</tr>
<tr>
<td>10:45 - 12:00</td>
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<td>10:15 - 12:15</td>
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<td>2:30 - 3:45</td>
<td>Tu/Fri</td>
<td>3:30 - 5:30</td>
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3rd Day – Friday, December 4, 2020

<table>
<thead>
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<tr>
<td>7:45 - 9:00</td>
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<td>7:45 - 9:45</td>
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<td>1:00 - 2:15</td>
<td>M/Th</td>
<td>10:15 - 12:15</td>
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**** 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 2020

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.

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 Affairs ............................................................... 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

Nine credit hours are considered full-time for graduate students. Graduate Research Assistants (GRAs) with one-half assistantship are required to register for at least 6 credit hours during the fall/spring semesters and 3 credit hours during the summer semester. GRAs must also register 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.

The residency requirement for doctoral students is 9 credit hours for two consecutive semesters or 6 credit hours for three consecutive semesters.

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 2020 must remove all INCOMPLETE GRADES by November 30, 2020. 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 2020-2021 academic year is provided by United HealthCare Student Resources. The premium must be paid before registration. Contact the Student Services Office (room D-100 ext. 37228) 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 – November 30 & December 1, 2020
Online Final Exams – December 2, 3, & 4, 2020

FINANCIAL CALENDAR, FEES, REFUNDS, AND TUITION

Please click http://onestop.utk.edu/tuition-fees/ link to the most current information. You may also contact Tim Johnson in the Budget and Finance Office at tjohnson@utsi.edu or phone number 931-393-7419.
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 https://hilltopics.utk.edu/

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.
AEROSPACE ENGINEERING

AE  500 Master’s Thesis (1-15)
    SEC.  001 CRN 42535  Abedi
    009 CRN 42551  Brooks
    010 CRN 42555  Kreth
    011 CRN 42557  Moeller
    012 CRN 42560  Schmisseur
    013 CRN 42561  Solies
    014 CRN 42562  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 42580  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.  004 CRN 53577
    TEXT: TBD
    TIME: Tuesday & Thursday 3:30 – 4:45 E-110
    PROF: Dr. James Coder

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 44796  (Same as Aviation System 503 001 CRN 53173)
    TEXT: M. Asselin; An Introduction to Aircraft Performance; AIAA Education Series, Reston, VA
    TIME: Tuesday & Friday 11:00 – 12:15 E-111
    PROF: Dr. Peter Solies
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 (3)
SEC. 001 CRN 45419
TIME: Tuesday & Thursday 1:50 – 3:05 E-110
PROF: Dr. Phillip Kreth

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

Revision of course content for AE 521: Aerodynamics of Compressible Fluids I will accelerate and broaden course content to provide a more comprehensive knowledge of compressible fluid dynamics for graduate students who have prior course experience covering compressible flows. Historically, for a non-trivial percentage of students in the course with Mechanical Engineering backgrounds, the course has been the students’ first exposure to the theory of compressible flow. With ME 599: Gas Dynamics, the intent is to provide an appropriate introduction to the material for graduate students; therefore, the course content of AE 521 can be enhanced to cover a much broader range of material at an accelerated pace.

Topics to be covered in the revised AE 521 course include the following:

- A review of normal and oblique shocks and Prandtl-Meyer expansions
- A review of Fanno and Rayleigh Flow
- Shock Interactions and Reflections
- A review of nozzle flows
- Unsteady wave motion
• Crocco’s Theorem and the Velocity Potential Equation
• Linearized Flow
• Conical Flow
• Method of Characteristics
• An introduction to Hypersonics / Newtonian Theory if time permits

Recommended pre-requisite is an undergraduate-level compressible flow course.

AE  532  Introduction to Turbulence (3)
SEC.  001 CRN 53224
TEXT:  *Turbulent Flows*; S.B. Pope; Cambridge University Press · Paperback · 771 pages
ISBN: 0521598869
TIME:  Tuesday & Thursday  8:50 – 10:05  E-110
PROF:  Dr. John Schmisseur

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

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

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

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

AE  590  Selected Engineering Problems (2-6)
SEC.  002 CRN 42588  Abedi
003 CRN 42589  Brooks
004 CRN 45420  Kreth
005 CRN 45421  Moeller
006 CRN 45422  Schmisseur
007 CRN 45423  Solies
008 CRN 45424  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 42592
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: Experimental Flight Mechanics: Fixed Wing Performance (3)


TIME: Tuesday & Friday 2:30 – 3:45  E-111

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.

(Prerequisite(s): 516 and 521.

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

AE 599 Special Topics in Aerospace Engineering: Data Measurement & Analysis (3)


TIME: Tuesday & Thursday 10:00 – 11:15  E-113

PROF: Dr. Phil Kreth

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

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

AE 599 Special Topics in Aerospace Engineering: Advanced Engineering Mathematics (3)

TEXT: No specific textbook is required for this class, as many texts on the subject exist. Students are free to choose whichever text best facilitates learning. Recommended texts include:

- *Advanced Engineering Mathematics* by E. Kreyszig
- *Advanced Mathematical Methods for Scientists and Engineers* by Bender and Orzog
- *Mathematical Methods for Physicists* by Arfken and Weber

TIME: Monday & Wednesday 8:50 – 10:05  E-110

PROF: Dr. Mark Gragston

This course provides an introduction and review of mathematical concepts relevant for advanced studies in engineering and science for modeling and problem solving. Applications focus on fluid dynamics and heat transfer. Topics covered include ordinary differential equations, perturbation techniques, partial differential equations, complex variable calculus, Fourier analysis, and probability/statistics.

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

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


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 transducers and actuators will be discussed.

Repeatability: May be repeated. Maximum 6 hours.

AE  600  Doctoral Research/Dissertation (3-15)
SEC.  004  CRN 42606  Abedi
005  CRN 42608  Brooks
006  CRN 42610  Kreth
007  CRN 42612  Moeller
008  CRN 42614  Schmisseur
014  CRN 42620  Solies
015  CRN 42621  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 48399

Methods of planning and conducting original research and proposal writing.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: Maximum 6 hours. May be repeated once.
Registration Restriction(s): Minimum student level – graduate / doctoral students.
Registration Permission: Departmental approval.

AVIATION SYSTEMS

AS  503  Air Vehicles (3)
SEC.  001  CRN 53173  (Same as AE 515 001 CRN 44796)
TIME:  Tuesday & Friday  11:00 – 12:15  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 521 Experimental Flight Mechanics: Fixed Wing Performance (3)
SEC. 001 CRN 53671 (Same as AE 599 001 CRN 42595)
TIME: Tuesday & Friday 2:30 – 3:45 E-111
PROF: Dr. Peter Solies

Fundamental theories, flight test techniques, and data collection and analyses for fixed wing aircraft performance. Topics: air data system calibration, takeoff and landing performance, turn performance, cruise performance, energy concepts, and aerodynamic modeling. Weekly classroom academics with approximately 4-6 flight labs.
(RE) Prerequisite(s): 503 or Aerospace Engineering 515.

BIOMEDICAL ENGINEERING

BME 500 Master’s Thesis (1-15)
SEC. 012 CRN 46288 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. 001 CRN 42636 (Video Recorded)
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.


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  530  Thin Film Enhancement of Biomedical Devices (3)
SEC.  001  CRN  53085
TEXT: Thin film coatings for biomaterials and biomedical applications; Edited by: Hans J Griesser;
Woodhead; ISBN #: 978-1-78242-453-6
TIME: Monday & Tuesday 2:40 – 3:55 CT Live Zoom Link
PROF: Dr. Jacqueline Johnson

Overview of the fundamentals of selected thin film deposition techniques and pertinent instrumentation
with an emphasis on applications to biomaterials. Structural characterization and tailoring of thin films for
implant-specific applications. Growth of thin films on biomaterial surfaces, the biological interface and
biocompatibility. Uniformity, adhesion, cytotoxicity and bacterial reduction synergy. Application of thin
films in tissue engineering and stem cell technologies.
Recommended Background: Biomaterials and cell and tissue-biomaterials interaction.
Registration Permission: Consent of instructor.

BME  590  Selected Biomedical Engineering Problems (2-6)
SEC.  001  CRN  46527
TEXT: TBD
TIME: TBD
PROF: Dr. Jacqueline Johnson

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Enrollment is limited to students in the non-thesis option.
Credit Level Restriction: Graduate credit only.
Registration Restriction(s): Minimum student level – graduate.
Registration Permission: Consent of instructor.

BME  595  Biomedical Seminar (1)
SEC.  002  CRN  45998
TEXT: None
TIME: Will be announced through email
PROF: Dr. Jacqueline Johnson

All phases of biomedical engineering, reports on current research at UTK and UTSI.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 20 hours.
Credit Level Restriction: Graduate credit only.
Registration Restriction(s): Minimum student level – graduate.

BME  599  Special Topics in BME: Micro/Nano Electro Mechanical Systems/Sensors (3)
SEC.  005  CRN  47953 (Same as AE 599 010 CRN  50817, ME 599 008 CRN  46512)
Reference:

**TIME:** Monday & Wednesday 3:30 – 4:45 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 transducers and actuators will be discussed.

*Repeatability: May be repeated. Maximum 12 hours.*

**BME 599 Special Topics in BME: Advanced Engineering Mathematics (3)**  
**SEC.: 001 CRN 42638** (Same as AE 006 CRN 48137, ME 013 CRN 50658)  
**TEXT:** No specific textbook is required for this class, as many texts on the subject exist. Students are free to choose whichever text best facilitates learning. Recommended texts include:  
- *Advanced Engineering Mathematics* by E. Kreyszig  
- *Advanced Mathematical Methods for Scientists and Engineers* by Bender and Orszag  
- *Mathematical Methods for Physicists* by Arfken and Weber  
**TIME:** Monday & Wednesday 8:50 – 10:05 E-110  
**PROF:** Dr. Mark Gragston

This course provides an introduction and review of mathematical concepts relevant for advanced studies in engineering and science for modeling and problem solving. Applications focus on fluid dynamics and heat transfer. Topics covered include ordinary differential equations, perturbation techniques, partial differential equations, complex variable calculus, Fourier analysis, and probability/statistics.

*Repeatability: May be repeated. Maximum 12 hours.*

**BME 600 Doctoral Research/Dissertation (3-15)**  
**SEC.: 011 CRN 45999**  
**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 48400**  
**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.

*Grading Restriction: Satisfactory/No Credit grading only.*  
*Repeatability: Maximum 6 hours. May be repeated once.*  
**Registration Restriction(s):** Minimum student level – graduate. PhD students only.  
**Registration Permission:** Consent of instructor.
ENGINEERING MANAGEMENT

EM  500  Master’s Thesis (1-15)
SEC.  001  CRN  47217  Simonton
SEC.  002  CRN  48802  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  42949  Tolk
SEC.  002  CRN  47924  Tolk

Application-oriented project to show competence in major academic area.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Requires enrollment in engineering management.
Credit Level Restriction: Graduate credit only.
Registration Restriction(s): Minimum student level – graduate.

EM  502  Registration for Use of Facilities (1-15)
SEC.  001  CRN  42950  Simonton
SEC.  002  CRN  48804  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  44838  UT Space Institute Campus
SEC.  002  CRN  44839  UT Knoxville Campus
SEC.  003  CRN  44840  Distance Education Campus

TEXT: TBD
TIME: TBD
PROF: Dr. Lynn Reed

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  44842  UT Space Institute Campus
SEC.  002  CRN  44843  Distance Education Campus
SEC.  003  CRN  44844  UT Knoxville Campus

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  542  Design of Experiments for Engineering Managers (3)
SEC. 001 CRN  52431  UT Space Institute Campus
      002 CRN  52432  UT Knoxville Campus
      003 CRN  52433  Distance Education Campus
TEXT: TBD
TIME: TBD
PROF: Dr. Alberto Garcia

Methodology for experiments in product, service, and process improvements. Factorial experiments,
screening designs, variance reduction, and other selected topics for engineering managers. Taguchi
(RE) Prerequisite(s): Industrial Engineering 516.

EM  600  Doctoral Research/Dissertation (3-15)
SEC. 001 CRN  44852  Simonton  UT Space Institute Campus
      002 CRN  44854  Simonton  Distance Education Campus
      003 CRN  47993  Yu      UT Space Institute Campus
      004 CRN  52676  Yu      Distance Education Campus
Grading Restriction: P/NP only.
Repeatability: May be repeated.
Registration Restriction(s): Minimum student level – graduate.

EM  602  Supply Chain and Logistics Systems Engineering (3)
SEC. 001 CRN  51376  UT Space Institute Campus
      002 CRN  51377  UT Knoxville Campus
      003 CRN  51378  Distance Education Campus
TEXT: Instructor will provide electronic files through Canvas
TIME: Monday       10:00 – 12:15   E-113
PROF: Dr. Andrew Yu

Introduces the concepts, methods and techniques of supply chain management and logistics support from
a systems engineering perspective. The discussion of different topics in the course will focus on the
different stages in a system life cycle.
(RE) Prerequisite(s): 537

INDUSTRIAL ENGINEERING

IE  516  Statistical Methods in Industrial Engineering (3)
SEC. 001 CRN  44917  UT Knoxville Campus
      002 CRN  44918  Distance Education Campus
Application of classical statistical techniques to industrial engineering problems. Statistics and statistical thinking in managerial context of organizational improvement; descriptive statistics and distribution theory; relationship between statistical process control techniques and classical statistical tools; parameter estimation and hypothesis testing; goodness-of-fit testing; linear regression and correlation; analysis of variance; single and multiple factor experimental design.

Recommended Background: Statistics 251 or equivalent

IE 526 Advanced Applications of Systems Modeling and Simulation (3)
SEC. 001 CRN 44928 UT Knoxville Campus
SEC. 002 CRN 44930 Distance Education Campus
SEC. 003 CRN 44931 UT Space Institute Campus

Modeling and simulation of business and industry systems to enhance management, strategic, and operational decision-making. Hands-on experiences of simulation software package (e.g., Arena) will be provided with case studies in manufacturing, supply chain and logistics, healthcare, etc.

Recommended Background: 306.

IE 527 Lean Production Systems (3)
SEC. 002 CRN 43173 Off-Campus Study US

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

(RE) Prerequisite(s): 515 or consent of instructor.

IE 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 43174 UT Knoxville Campus
SEC. 002 CRN 46373 UT Space Institute Campus
SEC. 003 CRN 51908 Distance Education Campus

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


Cross-listed: (Same as Chemical and Biomolecular Engineering 529; 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.

IE  550 Graduate Seminar (1)
SEC. 001 CRN 45275  UT Knoxville Campus
      002 CRN 45276  Distance Education Campus
      003 CRN 45277  UT Space Institute
TEXT: TBD
TIME: Friday           2:30 – 3:30 EST     UTK
PROF: Dr. Ming Jing

Seminar provides an opportunity for Master’s and Doctoral students to acquaint themselves with research being conducted by both faculty and graduate students in the Industrial and Systems Engineering Department, as well as select campus-wide and off-campus researchers from both academia and industry. Research work and relevant results are presented in a professional environment that promotes continued interaction among interested parties. Presentations are not restricted to thesis and dissertation work. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 6 hours. Comment(s): Admission to graduate program required.

MECHANICAL ENGINEERING

ME  500 Master’s Thesis (1-15)
SEC. 001 CRN 43233  Abedi
      021 CRN 43253  Brooks
      022 CRN 43254  Kreth
      023 CRN 43255  Moeller
      024 CRN 43256  Schmisser
      025 CRN 43257  Solies
      034 CRN 45434  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 45437  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 45035
TEXT: TBD
TIME: Tuesday & Thursday 10:30 – 11:45 E-110
PROF: Dr. Shin

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 49602 (Same as AE 517 001 CRN 49623)
TEXT: All required course materials will be provided. Recommended references:
ISBN: 97809979004906
TIME: Monday & Wednesday 12:10 – 1:25 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 524 Fracture Mechanics (3)
SEC. 001 CRN 48158
TIME: Monday & Wednesday 1:50 – 3:05 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  525 Combustion Chemical Reaction Flows I (3)
SEC.  001 CRN  49581
TIME: Tuesday & Friday       1:30 – 2:45       E-113
PROF: Dr. Trevor Moeller

Fundamentals: thermochemistry, chemical kinetics and conservation equations; phenomenological approach to laminar flames; diffusion and premixed flame theory; single droplet combustion; deflagration and detonation theory; stabilization of combustion waves in laminar streams; flammability limits of premixed laminar flames; introduction to turbulent flames.

(PE) Prerequisite(s): 522 and 541 or consent of instructor.

ME  529 Applications of Linear Algebra in Engineering Systems (3)
SEC.  001 CRN  43268 (Video Recorded)
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.


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  541 Fluid Mechanics I (3)
SEC.  001 CRN  45038
TEXT: TBD
TIME: Monday & Wednesday 10:30 – 11:45 E-110
PROF: Dr. 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.)

Recommended Background: A fluid mechanics course.

ME  584 Turbomachinery Systems I (3)
SEC. 001 CRN 45043
TIME: Monday & Wednesday 10:10 – 11:25 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.

Gas Turbine Engine propulsion, engine cycle analysis for turbojets and turbofan engines both on-design and off-design. Course analyzes ideal and real engines and uses supplied engine numerical models.

Comment(s): First-year graduate standing required.
Registration Permission: Consent of instructor.

ME  590 Selected Engineering Problems (2-6)
SEC. 001 CRN 43270 Abedi
002 CRN 43271 Brooks
003 CRN 45049 Kreth
004 CRN 45438 Moeller
005 CRN 45439 Schmisseur
006 CRN 45440 Solies
007 CRN 45441 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 43272
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.
ME  599 Special Topics in Mechanical Engineering: Data Measurement & Analysis (3)
SEC.  001 CRN  43274  (Same as AE 599 003 CRN 47357)
TIME: Tuesday & Thursday 10:00 – 11:15 E-113
PROF: Dr. Phil Kreth

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

ME 599 Special Topics in ME: Micro/Nano Electro Mechanical Systems/Sensors (3)
SEC.  008 CRN 46512 (Same as AE 599 010 CRN 50817, BME 599 005 CRN 47953)
Reference:
TIME: Monday & Wednesday 3:30 – 4:45 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 transducers and actuators will be discussed.

ME  599 Special Topics: Fundamentals of Gas Dynamics for Propulsion (3)
SEC.  009 CRN 47261
TIME: Monday & Wednesday 2:40 – 3:45 E-111
PROF: Dr. Milt Davis

Fundamentals of gas dynamics including varying area flow, flow through nozzles, standing normal shocks, Oblique shocks, flow with friction, flow with heat addition and an introduction to propulsion

ME 599 Special Topics in Mechanical Engineering: Advanced Engineering Mathematics (3)
SEC. 013 CRN 50658  (Same as AE 599 006 CRN 48137, BME 599 001 CRN 42638)
TEXT: No specific textbook is required for this class, as many texts on the subject exist. Students are free to choose whichever text best facilitates learning. Recommended texts include:
- *Advanced Engineering Mathematics* by E. Kreyszig
- *Advanced Mathematical Methods for Scientists and Engineers* by Bender and Orzog
- *Mathematical Methods for Physicists* by Arfken and Weber

TIME: Monday & Wednesday 8:50 – 10:05 E-110
PROF: Dr. Mark Gragston

This course provides an introduction and review of mathematical concepts relevant for advanced studies in engineering and science for modeling and problem solving. Applications focus on fluid dynamics and heat transfer. Topics covered include ordinary differential equations, perturbation techniques, partial differential equations, complex variable calculus, Fourier analysis, and probability/statistics.

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

*Registration Permission: Consent of instructor.*

ME 600 Doctoral Research/Dissertation (3-15)
SEC. 015 CRN 43291 Abedi
SEC. 016 CRN 43292 Brooks
SEC. 018 CRN 43294 Kreth
SEC. 019 CRN 43295 Moeller
SEC. 026 CRN 43302 Schmisseur
SEC. 027 CRN 43303 Solies
SEC. 028 CRN 43304 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 48886
TEXT: TBD
TIME: TBD
PROF: Dr. Kivanc Ekici

Methods of planning and conducting original research and proposal writing.

*Grading Restriction: Satisfactory/No Credit grading only.*

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

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

*Registration Permission: Departmental approval.*

ME 613 Advanced Radiation Heat Transfer (3)
SEC. 001 CRN 47061
TEXT: *Thermal Radiation Heat Transfer*; Robert Siegel and John R. Howell; Publisher: Taylor and Francis; Edition 3rd or 4th; ISBN #: 1-56032-839-8
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 531 Classical Mechanics (3)
SEC. 002 CRN 41936
TEXT: TBD
TIME: TBD
PROF: Dr. Christian Parigger

Variational formulation, Lagrange’s and Hamilton’s equations, constraints, canonical transformations, Hamilton-Jacobi theory and action-angle variables.

Phys 599 Seminar (1)
SEC. 009 CRN 47954
TEXT: Classic Texts and Literature
TIME: 2nd, 4th 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 41964 Parigger

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