Fall 2021 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
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CALENDAR - 2021 FALL SEMESTER

Academic Calendar Dates are Subject to Change

Priority Registration .................................................................................................................. April 5, 2021
Admission to Candidacy Forms for Fall 2021 Commencement ................................................. August 13, 2021
Fall 2021 Graduation Application Deadline (submit online at MyUTK) .................................. August 13, 2021
Graduation Fee Payment Deadline (MS $30, PhD $75) ............................................................ August 13, 2021
Payment Due for Priority Registration .................................................................................... August 16, 2021
Late Registration and late fees ($100 Late Fee) ......................................................................... August 18, 2021
Classes begin ............................................................................................................................ August 18, 2021
Last Day to final register, add, change grading options or drop without a “W” ....................... August 24, 2021
Payment Due for Late Registration ............................................................................................ TBD
Labor Day .................................................................................................................................... September 6, 2021
Late Registration after 14th day ($200 Late Fee) ........................................................................ TBD
Preliminary Thesis/Dissertation Review Deadline (thesis@utk.edu) ......................................... September 24, 2021
Fall Break (No Classes) ............................................................................................................. September 30 – October 1, 2021
Last day to schedule final exam (dissertation) .......................................................................... October 29, 2021
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 (thesis/dissertation) ........................................................................ November 5, 2021
Drop with a “W” ...................................................................................................................... November 9, 2021
Thesis/Dissertation Deadline 5:00 p.m. EST ........................................................................... November 19, 2021
Submit report of final examination (Pass/Fail) form ................................................................ November 19, 2021
No Class Day .............................................................................................................................. November 24, 2021
Thanksgiving Holidays ............................................................................................................. November 25 – 26, 2021
Classes End ................................................................................................................................ December 1, 2021
Total Withdraw from the University Deadline ......................................................................... December 1, 2021
Study Day ................................................................................................................................... December 2, 2021
All "INCOMPLETE" must be removed for Graduation ............................................................... December 3, 2021
Final Exam Period..................................................................................................................... December 3, 6 & 7, 2021
Graduate Hooding Ceremony (UTK) ......................................................................................... December 9, 2021
COMMENCEMENT (UTK) ...................................................................................................... December 10, 2021
Official Graduation Date ........................................................................................................... December 11, 2021
Deadline for Submission of Admission to Candidacy for students
   Graduating Spring 2022 and Graduation Application .......................................................... January 14, 2022

Second thesis/dissertation deadlines
   Schedule Dissertation Defense by November 29, 2021
   Defense Completed by December 6, 2021
   Second Deadline Application Submitted by December 6, 2021
   http://gradschool.utk.edu/forms-central/
   Thesis/Dissertation Submitted and Accepted by January 24, 2022, 5:00 p.m. EST
   (Student will receive diploma spring 2022 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 2022

Priority Registration ................................................................................................................... TBD
Final Registration ....................................................................................................................... TBD
Classes Begin ............................................................................................................................. January 24, 2022
Martin Luther King Day (Holiday) ................................................................. January 17, 2022
Spring Break ................................................................................................... March 14 – 18, 2022
No Class Day ................................................................................................. April 14, 2022
Spring Recess ............................................................................................... April 15, 2022
Classes End ..................................................................................................... May 10, 2022
Study Day .................................................................................................... May 11, 2022
Exam Period .................................................................................................. May 12, 13 & 16, 2022
Graduate Hooding Ceremony (UTK) .............................................................. TBD
University College Commencement Ceremonies ......................................... TBD
Official Graduation Date on Transcript ......................................................... May 21, 2022

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

FALL SEMESTER 2021
STUDY PERIOD AND FINAL EXAM SCHEDULE

LAST DAY OF CLASSES .............................................................................. December 1, 2021
STUDY DAY .................................................................................................. December 2, 2021

ONLINE FINAL EXAMS

REGULAR CLASS TIME EXAM TIME

1st Day – Friday, December 3, 2021

7:45 - 9:00 M/Th 7:45 - 9:45
10:45 - 12:00 M/Th 10:15 - 12:15
9:15 - 10:30 M/Th 1:00 - 3:00
2:30 - 3:45 M/Th 3:30 - 5:30

2nd Day – Monday, December 6, 2021

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

3rd Day – Tuesday, December 7, 2021

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 2021

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.

REGISTRATION

Students will log in to MyUTK using your NetID and password.

Log into MyUTK via the UTK homepage (www.utk.edu).

On the UTK homepage use either the ‘Menu’ at the top right and click on MyUTK or scroll down to the bottom left and you will also find MyUTK under the ‘Communications’ heading.

Before registering, clear and pay any financial holds. Holds are listed on MyUTK under the heading “For Your Review,” located in the upper right-hand corner.

Scroll down to “UTK Student Registration Links” and click “Search for Classes” to look up sections and register.

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

If you have and questions, contact Charlene Hane in Student Affairs D-100, (931) 393-7228.

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)-37228
Budget and Finance Office: ............................................................. 1-888-822-UTSI (8874)-37419
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 Charlene Hane, Student Affairs, University of Tennessee Space Institute, MS-7, 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 Charlene Hane at (931) 393-7228 or 888-822-8874 ext. 37228 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 Affairs, 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 Affairs, 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 Affairs 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 2021 must remove all INCOMPLETE GRADES by December 3, 2021. Contact Charlene Hane, Student Affairs, 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 Affairs.

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 Affairs.

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 Affairs. Failure to notify Student Affairs 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 Affairs 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 – December 2, 2021
Final Exams – December 3, & 6 & 7, 2021

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

Please click [http://onestop.utk.edu/tuition-fees/](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/](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.
THE UNIVERSITY RESERVES THE RIGHT TO REVISE
ANY INFORMATION LISTED IN THIS TIMETABLE OF CLASSES

The University of Tennessee Space Institute
Fall 2021 Course Listings

AEROSPACE ENGINEERING

AE  500  Master’s Thesis (1-15)
SEC. 001 CRN 42421  Abedi
       009 CRN 42437  Kreth
       010 CRN 42441  Moeller
       011 CRN 42443  Schmisseur
       012 CRN 42446  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 42466  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 45422
TEXT: TBD
TIME: Monday & Wednesday     12:10 – 1:25       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  513  Experimental Methods in Fluid Mechanics (3)
SEC. 001 CRN 53370
TEXT: Instrumentation, Measurements, and Experiments in Fluids, 2nd ed. by Ethirajan Rathakrishnan from CRC Press
ISBN: 978-1-4987-8485-6
TIME: Monday & Wednesday     8:50 – 10:05       E-111
PROF: Dr. Phil Kreth
Experimental techniques with laboratory experiments; representative experiments: hot wire anemometry and turbulence measurements, flow visualization, wind tunnel tests, water table experiments, supersonic flow experiments, boundary layer measurements, laser-optical measurements.

(DE) Prerequisite(s): 541.

AE  515  Air Vehicle Aerodynamics and Performance (3)
SEC. 001  CRN 44633
TIME: Tuesday & Friday 11:00 – 12:15  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 49296  (Same as ME 517 001 CRN 49275)
TIME: Tuesday & Thursday 1:50 – 3:05  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 (3)
SEC. 001  CRN 45240
TIME: Tuesday & Thursday 8:50 – 10:05  E-113
PROF: Dr. Phillip Kreth

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

AE  525  Hypersonic Flow (3)
SEC. 001  CRN 53567
TEXT: TBD
<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
<th>Time</th>
<th>Location</th>
<th>Prof.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Slender body flow; similitude; Newtonian theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow.</td>
<td></td>
<td>Tuesday &amp; Thursday</td>
<td>1:00 – 2:15</td>
<td>E-111</td>
</tr>
<tr>
<td>AE 532</td>
<td>Introduction to Turbulence</td>
<td>3</td>
<td></td>
<td>Tuesday &amp; Thursday</td>
<td>10:30 – 11:45</td>
<td>E-110</td>
</tr>
<tr>
<td>AE 536</td>
<td>Continuum Mechanics</td>
<td>3</td>
<td>SEC. 001 CRN 50251</td>
<td>Tuesday &amp; Thursday</td>
<td>3:50 – 4:45</td>
<td>E-110</td>
</tr>
<tr>
<td>AE 569</td>
<td>Plasma Dynamics</td>
<td>3</td>
<td>SEC. 001 CRN 47702</td>
<td>Tuesday &amp; Friday</td>
<td>1:00 – 2:15</td>
<td>E-113</td>
</tr>
<tr>
<td>AE 581</td>
<td>Rocket Propulsion</td>
<td>3</td>
<td>SEC. 001 CRN 53375</td>
<td>Monday &amp; Thursday</td>
<td>1:00 – 2:15</td>
<td>E-113</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>AE</th>
<th>590</th>
<th>Selected Engineering Problems (2-6)</th>
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<tbody>
<tr>
<td>SEC.</td>
<td>002</td>
<td>CRN 42474 Abedi</td>
</tr>
<tr>
<td></td>
<td>003</td>
<td>CRN 42475 Kreth</td>
</tr>
<tr>
<td></td>
<td>004</td>
<td>CRN 45241 Moeller</td>
</tr>
<tr>
<td></td>
<td>005</td>
<td>CRN 45242 Schmisseur</td>
</tr>
<tr>
<td></td>
<td>006</td>
<td>CRN 45243 Zhang</td>
</tr>
</tbody>
</table>

Registration Permission: Consent of Instructor.

Repeatability: May be repeated. Maximum 6 hours.

Comment(s): Enrollment limited to students in problems option.

AE 595 Aerospace Engineering Seminar (1)

<table>
<thead>
<tr>
<th>SEC.</th>
<th>001</th>
<th>CRN 42478</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEXT:</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>TIME:</td>
<td>Will be announced through email</td>
<td></td>
</tr>
<tr>
<td>PROF:</td>
<td>Dr. Trevor Moeller</td>
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</tbody>
</table>

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: Partial Differential Equations (3)

<table>
<thead>
<tr>
<th>SEC.</th>
<th>001</th>
<th>CRN 42481 (Same as ME 599 003 CRN 47102)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME:</td>
<td>Tuesday &amp; Friday 9:30 – 10:45 E-111</td>
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<tr>
<td>PROF:</td>
<td>Dr. Monty Smith</td>
<td></td>
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</tbody>
</table>

Mathematical and numerical solutions to classic problems in partial differential equations and their physical interpretation. Topics to be covered include: the heat equation, separation of variables methods, Fourier series, vibrating strings and membranes, the wave equation, Sturm-Liouville eigenvalue and eigenfunction problems, and introduction to finite difference methods.

Repeatability: May be repeated. Maximum 6 hours.

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

<table>
<thead>
<tr>
<th>SEC.</th>
<th>002</th>
<th>CRN 42482 (Same as BME 599 001 CRN 42524, ME 599 010 CRN 47126)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEXT:</td>
<td>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 for each topic. Recommended texts include:</td>
<td></td>
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<tr>
<td></td>
<td>Advanced Engineering Mathematics by E. Kreyszig</td>
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<tr>
<td></td>
<td>Mathematical Methods in the Physical Sciences by M. Boas</td>
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<td></td>
<td>Mathematical Methods for Physicists by Arfken and Weber</td>
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<tr>
<td>TIME:</td>
<td>Tuesday &amp; Thursday 8:50 – 10:05 E-110</td>
<td></td>
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<tr>
<td>PROF:</td>
<td>Dr. Mark Gragston</td>
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This course provides an introduction and review of analytical mathematical concepts relevant for advanced studies in engineering and science for modeling and problem solving. Topics covered include ordinary differential equations, perturbation techniques, partial differential equations, complex variable calculus, Fourier analysis, and probability/statistics. The intent is to prepare students for advanced study in topics like heat transfer, dynamical systems, viscous/inviscid fluid flow, turbulence, and more. **Note that this course has departmental approval to count as a graduate math credit for MABE departmental degree programs.**

Repeatability: May be repeated. Maximum 6 hours.

AE 599 Special Topics in Aerospace Engineering: Experimental Flight Mechanics-Fixed Wing Performance (3)
SEC. 006 CRN 47884
TIME: Wednesday 1:00 – 3:30 E-111
PROF: Dr. Peter Solies

Fundamental theories, flight test techniques, 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 several flight simulator labs.

Repeatability: May be repeated. Maximum 6 hours.

AE 599 Special Topics in AE: Micro/Nano Electro Mechanical Systems/Sensors (3)
SEC. 010 CRN 50456 (Same as ME 599 008 CRN 46301, BME 599 005 CRN 47700)
Reference:
TIME: Monday & Wednesday 3:45 – 5:00 Online
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 6 hours.

AE 600 Doctoral Research/Dissertation (3-15)
SEC. 004 CRN 42492 Abedi
005 CRN 42494 Kreth
006 CRN 42496 Moeller
007 CRN 42498 Schmisseur
008 CRN 42500 Zhang

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

**BIOMEDICAL ENGINEERING**

BME  500 Master’s Thesis (1-15)  
SEC.  012 CRN 46086  Johnson  

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

BME  485 Advanced Biomaterials: Biological Application of Nanomaterials (3)  
SEC.  001 CRN 53444  
Cost of textbook $115 (Course materials will be provided – book purchase is not needed)  
TIME: Monday, Wednesday & Friday   12:00 – 12:50 CT     Live Zoom Link  
PROF: Dr. Jacqueline Johnson

0-d, 1-d and 2-d nanomaterials synthesis and characterization with emphasis on surface properties.  
Chemical and biological functionalization of nanomaterials and nano-bio interfaces. Biological and biomedical application of nanomaterials.

Biological/medical uses of nanoscale materials. Includes the following topics: 0-d, 1-d, and 2-d nanomaterials synthesis and characterization with an emphasis on surface properties. Chemical and biological functionalization of nanomaterials and nano-bio interfaces. Biological and biomedical application of nanomaterials.

(RE) Prerequisite(s): MSE 474.

BME  578 Advanced Biomaterials: Biological Application of Nanomaterials (3)  
SEC.  001 CRN 51983  
Cost of textbook $115 (Course materials will be provided – book purchase is not needed)  
TIME: Monday, Wednesday & Friday   12:00 – 12:50 CT     Live Zoom Link  
PROF: Dr. Jacqueline Johnson

Focuses on the biological/medical uses of nanoscale materials. Includes the following topics: 0-d, 1-d, and 2-d nanomaterials synthesis and characterization with an emphasis on surface properties. Chemical and biological functionalization of nanomaterials and nano-bio interfaces. Biological and biomedical application of nanomaterials. The state-of-the-art research papers will be reviewed and discussed.
Biological/medical uses of nanoscale materials. Includes the following topics: 0-d, 1-d, and 2-d nanomaterials synthesis and characterization with an emphasis on surface properties. Chemical and biological functionalization of nanomaterials and nano-bio interfaces. Biological and biomedical application of nanomaterials.

Recommended Background: 474.

Comment(s): Prior knowledge may satisfy prerequisites, with consent of instructor.

BME 595 Biomedical Seminar (1)
SEC. 002 CRN 45811
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 47700 (Same as AE 599 010 CRN 50456, ME 599 008 CRN 46301)
Reference:
TIME: Monday & Wednesday 3:45 – 5:00 Online
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.
Registration Permission: Consent of instructor.

BME 599 Special Topics in BME: Advanced Engineering Mathematics (3)
SEC. 001 CRN 42524 (Same as AE 599 002 CRN 42482, ME 599 010 CRN 47126)
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 for each topic. Recommended texts include:
- Advanced Engineering Mathematics by E. Kreyszig
- Mathematical Methods in the Physical Sciences by M. Boas
- Mathematical Methods for Physicists by Arfken and Weber
TIME: Tuesday & Thursday 8:50 – 10:05 E-110
PROF: Dr. Mark Gragston

This course provides an introduction and review of analytical mathematical concepts relevant for advanced studies in engineering and science for modeling and problem solving. Topics covered include
ordinary differential equations, perturbation techniques, partial differential equations, complex variable calculus, Fourier analysis, and probability/statistics. The intent is to prepare students for advanced study in topics like heat transfer, dynamical systems, viscous/inviscid fluid flow, turbulence, and more. **Note that this course has departmental approval to count as a graduate math credit for MABE departmental degree programs.**

Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

BME 600 Doctoral Research/Dissertation (3-15)
SEC. 011 CRN 48141 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 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.

**INDUSTRIAL ENGINEERING**

IE 500 Master’s Thesis (1-15)
SEC. 010 CRN 47546 Simonton
011 CRN 47547 Yu
012 CRN 47548 Shi

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

IE 501 Design Project (1-3)
SEC. 009 CRN 50215 UT Space Institute Campus Tolk
012 CRN 53326 Distance Education Campus Tolk

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Enrollment limited to industrial engineering students in non-thesis option.
Credit Level Restriction: Graduate credit only.
Registration Restriction(s): Minimum student level – graduate.
### IE 516 Statistical Methods in Industrial Engineering (3)
- **SEC.** 001 CRN 44752 UT Knoxville Campus
- **SEC.** 002 CRN 44753 Distance Education Campus
- **SEC.** 003 CRN 44754 UT Space Institute Campus
- **TEXT:** TBD
- **TIME:** Tuesday 5:30 – 7:10 E-113
- **PROF:** Dr. Tony Shi

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 535 Productivity and Quality Engineering (3)
- **SEC.** 001 CRN 52672 UT Space Institute Campus
- **SEC.** 002 CRN 52673 UT Knoxville Campus
- **SEC.** 003 CRN 53331 Distance Education Campus
- **TEXT:** TBD
- **TIME:** Monday 4:00 – 6:30 Online
- **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.

### IE 537 Analytical Methods for Engineering Managers (3)
- **SEC.** 001 CRN 52676 UT Space Institute Campus
- **SEC.** 002 CRN 52677 UT Knoxville Campus
- **SEC.** 003 CRN 53334 Distance Education Campus
- **TEXT:** TBD
- **TIME:** Monday 4:00 – 6:30 Online
- **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.

### IE 544 Manufacturing Systems Modeling and Analysis (3)
- **SEC.** 001 CRN 52680 UT Space Institute Campus
- **SEC.** 002 CRN 52681 UT Knoxville Campus
- **SEC.** 003 CRN 53335 Distance Education Campus
- **TEXT:** TBD
- **TIME:** Monday 10:00 – 12:30 E-113
- **PROF:** Dr. Andrew Yu

Introduces the classical modeling and analysis methods for modern manufacturing systems. The main topics of this course will cover a broad range of concepts, including modeling of manufacturing systems;
performance analysis of manufacturing systems; production planning and scheduling; and modeling, monitoring, diagnosis, and quality control of manufacturing processes.

IE 600 Doctoral Research/Dissertation (3-15)
SEC. 010 CRN 47556 Simonton UT Space Institute Campus
      018 CRN 53338 Simonton Distance Education Campus
      011 CRN 47557 Yu UT Space Institute Campus
      019 CRN 53340 Yu Distance Education Campus
      012 CRN 47952 Shi UT Space Institute Campus
      020 CRN 53342 Shi Distance Education Campus

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

MATHEMATICS

Math 443 Complex Variables (3)
SEC. 002 CRN 53378
TEXT: TBD
TIME: TBD
PROF: Dr. Christian Parigger

Introduction to the theory of functions of a complex variable, including contour integrals and conformal mapping properties.
(RE) Prerequisite(s): 241 or 247.

MECHANICAL ENGINEERING

ME 500 Master’s Thesis (1-15)
SEC. 001 CRN 43116 Abedi
      021 CRN 43136 Kreth
      022 CRN 43137 Moeller
      023 CRN 43138 Schmisseur
      024 CRN 43139 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 45256 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: Monday & Wednesday 3:50 – 4:45 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  49275 (Same as AE 517 001 CRN 49296)
TEXT: All required course materials with be provided. Recommended references:
ISBN: 9780979004902
TIME: Tuesday & Thursday 1:50 – 3:05 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  521 Thermodynamics (3)
SEC.  002 CRN  45423
TIME: Monday & Wednesday 10:30 – 11:45 E-111
PROF: Dr. Milt Davis

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

Fundamentals of engineering thermodynamics concentrating on 1st & 2nd Law with applications to vapor and gas cycles and application of ideal mixture analysis along with an introduction into combustion.

Recommended Background: Undergraduate thermodynamics.
ME  536  Continuum Mechanics (3)
SEC.  001  CRN  48589  (Same as AE 536 001 CRN 50251)
TEXT:  All required course materials will be provided.
TIME:  Tuesday & Thursday  3:50 – 4:45       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.

ME  590  Selected Engineering Problems (2-6)
SEC.  001  CRN  43153  Abedi
002  CRN  43154  Kreth
003  CRN  44883  Moeller
004  CRN  45257  Schmisseur
005  CRN  45258  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  43155
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: Partial Differential Equations (3)
SEC.  003  CRN  47102  (Same as AE 599 001 CRN 42481)
TIME:  Tuesday & Friday       9:30 – 10:45       E-111
PROF:  Dr. Monty Smith

Mathematical and numerical solutions to classic problems in partial differential equations and their physical interpretation. Topics to be covered include: the heat equation, separation of variables methods, Fourier series, vibrating strings and membranes, the wave equation, Sturm-Liouville eigenvalue and eigenfunction problems, and introduction to finite difference methods.
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

ME  599  Special Topics in ME: Micro/Nano Electro Mechanical Systems/Sensors (3)
SEC.  008  CRN  46301  (Same as AE 599 010 CRN 50456, BME 599 005 CRN 47700)
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.
Registration Permission: Consent of instructor.
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 48588
TEXT: TBD
TIME: TBD
PROF: Dr. Jeffrey Reinbolt

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.

PHYSICS

Phys 500  Thesis (1-15)
SEC. 002  CRN 41742
TEXT: TBD
TIME: TBD
PROF: Dr. Christian Parigger

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

Phys 531  Classical Mechanics (3)
SEC. 002  CRN 41839
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 600  Doctoral Research/Dissertation (3-15)
SEC. 002  CRN 41867  Parigger

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