# Summer 2016
# Registration Announcement


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WWW.UTSI.EDU

SPACE INSTITUTE

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## CALENDAR - SUMMER SEMESTER 2016

Priority Registration.....February 24, 2016
Admission to Candidacy Forms for Summer 2016 Commencement.....April 29, 2016
Summer 2016 Graduation Application Deadline submit online at MyUTK .....April 29, 2016
Graduation Fee Payment Deadline (MS $30, PhD $75).....April 29, 2016
**Late Registration and late fees ($100 Late Fee) .....June 2, 2016 – June 15**
Classes begin.....June 2, 2016
Last Day to Final Register, Add, Change Grading Options or Drop Without a "W" ..June 10, 2016
**Late Registration and late fees after 14th day ($200 Late Fee)..... June 16, 2016 forward**
Preliminary Thesis/Dissertation Review Deadline .....June 17, 2016
Independence Day Holiday.....July 4, 2016
Last day to schedule final exam non-thesis .....July 8, 2016
Last day to schedule final exam thesis.....July 8, 2016
Last day to schedule final exam dissertation .....July 8, 2016
Last day to take final exam (non-thesis/thesis/dissertation students) .....July 15, 2016
Drop with a "W" .....July 22, 2016
Electronic Thesis/Dissertation to TRACE (5:00 P.M. EST) .....July 29, 2016
Submit report of final examination (Pass/Fail) form .....July 29, 2016
Deadline for Submission of Admission to Candidacy for students
Graduating Fall 2016 and Graduation Application.....August 9, 2016
Deadline for removing "INCOMPLETE" grades .....August 9, 2016
Classes End.....August 9, 2016
Exam Period (Exams are given during the regularly scheduled class meeting times.)
Total Withdraw from the University Deadline .....August 9, 2016
No Commencement Ceremony or Graduate Hooding – Graduation Date..... August 12, 2016
Second thesis/dissertation deadlines
Defense Completed by August 9, 2016
Second Deadline Application Submitted by August 9, 2016
http://gradschool.utk.edu/forms/Second%20Deadline%20Graduation%20Application.pdf
and submit a new graduation application for Fall graduation
Thesis/Dissertation Submission Deadline by August 16, 2016
(Student will receive diploma fall 2016 semester, but will not be required to register for thesis/dissertation credits)

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## FALL SEMESTER 2016

Priority Registration.....March 21, 2016
Late Registration .....August 17, 2016
Classes Begin.....August 17, 2016
Labor Day Holiday ..... September 5, 2016
Fall Break..... October 6 -7, 2016
Thanksgiving Break..... November 24 – 25, 2016
Classes End..... November 29, 2016
Study Period..... November 30, 2016
Exam Period.....December 1, 2 & 5, 2016
Graduate Hooding Ceremony (UTK) .....December 8, 2016
Commencement (UTK) .....December 9, 2016
Official Graduation Date.....December 9, 2016

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

**SUMMER SEMESTER 2016**

**EXAM SCHEDULE**

LAST DAY OF CLASSES.....August 9, 2016

FINAL EXAMS FOR SUMMER ARE GIVEN DURING THE REGULARLY SCHEDULED CLASS MEETING TIMES.

**** ATTENTION ****

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

**REGISTRATION ANNOUNCEMENT**
**SPRING SEMESTER 2016**

## REGISTRATION PROCEDURE

## GRADUATE ACADEMIC ADVISING

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

## REGISTRATION

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

*Log in to MyUTK. You can find a link by looking under "M" on the A-Z index (http://www.utk.edu/alpha/) or by typing myutk.utk.edu directly into your browser. You will need to log in by typing utk\your NetID in the "username" field and then your NetID password in the "password" field.

*Before you attempt to register, clear and pay any financial holds (parking tickets, library fines, fees, etc.).

*Look under the "For Your Review" heading on the MyUTK portal page (located in the upper right-hand corner) for notification of any holds you may have.

*Once you are logged into "My UTK," scroll down to "UTK Student Registration Links." Click on "Search for Classes" to look up sections and then register.

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

If you have any questions, call the Office of the University Registrar at 865-974-2101 or contact Charlene Hane in Student Services room A-206, phone 931-393-7228, email chane@utsi.edu.

## TOLL-FREE NUMBERS

For a specific office: .....1-888-822-UTSI (8874) and the extension number.
For general information: .....1-888-822-UTSI (8874)
Admissions Office: ..... 1-888-822-UTSI (8874)-37213
Budget and Finance Office: ..... 1-888-822-UTSI (8874)-37297
Student Services..... 1-888-822-UTSI (8874)-37228

## APPLICATION FOR ADMISSION

No student will be allowed to register unless a completed Application for Admission to the Graduate School of the University of Tennessee, Knoxville (UTK) is on file in the Registrar's Office. An Application for Admission to the UTK Graduate School should be completed online at https://www.applyweb.com/utg and must be accompanied by a $60.00 non-refundable application fee, payable to The University of Tennessee Space Institute. All applicants are required to provide one official transcript of all undergraduate and graduate records, GRE test

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

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

**TOTAL WITHDRAWAL FROM THE UNIVERSITY**

If, after registering for classes and either returning your fee payment or your Confirmation of Attendance form to the Bursar's Office, you decide not to enroll for this term, you must immediately notify Charlene Hane, Student Services, at UTSI. If you withdraw officially on or before a Change of Registration deadline, but after the no "W" deadline for a particular session, the grade of "W" will be issued.

**GRADES**

Students may obtain their grades through the web at MyUTK or contact Charlene Hane, Student Services, Office A-206, (931) 393-7228.

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

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

**FULL-TIME STUDENTS**

Students enrolled in at least 9 semester hours during the Fall/Spring semesters or 6 hours in the Summer term are considered full-time students. Research Assistants must be full-time students and also enroll in one of the MABE 595 seminars or a PHYS 599 seminar each term, unless a waiver is granted by the Associate Executive Director.

**REMOVAL OF INCOMPLETE GRADES**

All Incomplete Grades (I) must be removed prior to graduation. The instructor, in consultation with the student, decides the terms for the removal of the I, including the time limit for removal. If the I is not removed within one calendar year, the grade will be changed to an F. The course will not be counted in the cumulative grade point average until a final grade is assigned. No student may graduate with an I on the record. Students planning to graduate Summer Semester 2016 must remove all INCOMPLETE GRADES by August 9, 2016. Contact Charlene Hane, Student Services, to remove an Incomplete Grade.

## REPEATING A COURSE

No graduate student may repeat a course for the purpose of raising a grade already received, with the exception of a NC course. A graduate student cannot do additional work nor repeat an examination to raise a final grade.

## ADMISSION TO CANDIDACY

### MASTER OF SCIENCE DEGREE:

Each M.S. student, including IE Capstone Project students, is responsible for submitting a completed and signed Admission to Candidacy Application at least one semester prior to receiving the degree.

Candidacy committee changes or course changes must be submitted to the committee chairman using a Revision form. If changing from a thesis option to a non-thesis option or vice versa, a new Admission to Candidacy Application must be submitted. All forms must be processed through Student Services.

### DOCTORAL DEGREE:

A Doctoral Committee should be formed during the student's first year of doctoral study. Any changes to the doctoral committee (deletions or additions) must be submitted to the Committee Chairman using a Revision form for approval. Each doctoral student is responsible for submitting a completed Admission to Candidacy form signed by the doctoral committee at least one semester prior to receiving the degree. All forms must be processed through Student Services.

## CONTINUOUS ENROLLMENT

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

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

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

## CONSEQUENCES OF NON-ENROLLMENT WITHOUT LEAVE OF ABSENCE

Graduate students who do not maintain continuous enrollment as stipulated in the "Continuous Enrollment" policy will lose their active student status. A student who has lost his or her active status without having been granted a Leave of Absence for the period of non-enrollment ahead of

time will not be allowed to continue in his her graduate program until readmitted. (see policy on "Readmission" in the Graduate Catalog for more details).

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

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

**FINAL EXAM FOR NON-THESIS, CAPSTONE PROJECT STUDENTS, THESIS AND DISSERTATION STUDENTS**

A candidate presenting a thesis or dissertation must pass a final oral examination on all work offered for the degree. The examination is scheduled through Student Services. Failure to notify Student Services of the examination date will put the student at risk for graduating that semester. Final examinations not properly scheduled MUST be repeated. The final draft of the thesis must be distributed to the committee members at least two weeks prior to the date of the final examination. In case of a grade of "Fail", the candidate may not apply for re-examination until the following semester. The result of the second examination is final.

**UT POLICY ON INSURANCE FOR INTERNATIONAL STUDENTS**

All foreign national students registered with the University of Tennessee, Knoxville, are required to have comprehensive medical insurance. The policy for the 2016-2016 academic year is provided by United HealthCare Student Resources. The premium must be paid before registration. Contact the Human Resources Office (room C-106 ext. 37267) for further information.

**GENERAL SEMINAR**

A number of seminars of interest to all UTSI students and general public will be offered throughout the semester.

**FINAL EXAM DATES**

Final exams for summer semester are given during the regularly scheduled class meeting time.

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

Please click FEES link to the most current information. You may also contact Jennifer Boyles in the Business and Finance Office at jboyles@utsi.edu or phone number 931-393-7297.

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

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

Credit or Debit Cards

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

**HONOR STATEMENT**

The following Honor Statement is signed by all students applying to The Graduate School:

"An essential feature of The University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."

For official information on all UTK Graduate School policies, refer to the current UTK Graduate Catalog available at http://catalog.utk.edu. The student handbook "Hilltopics" is available online at http://dos.utk.edu/hilltopics/ .

**The University of Tennessee Space Institute reserves the right to cancel any class with an insufficient number of students, or for other reasons.**

**THE UNIVERSITY OF TENNESSEE POLICY ON A DRUG-FREE CAMPUS AND WORKPLACE**

In support of the Drug-Free Workplace Act of 1988 (Public Law 100-690) and the Drug-Free Schools and communities Act of 1989, the University of Tennessee is notifying all students, faculty, and staff of the following university policy approved by the UT Board of Trustees on 21 June 1990.

It is the policy of the University of Tennessee to maintain a safe and healthful environment for its students and employees. Therefore, university policy prohibits the unlawful use, manufacture, possession, distribution, or dispensing of drugs ("controlled substances" as defined in the Controlled Substances Act, 21 U.S.C. 812) and alcohol on university property or during university activities.

Violation of this policy is grounds for disciplinary action--up to and including immediate discharge for an employee and permanent dismissal of a student. Federal and state laws provide additional penalties for such unlawful activities, including fines and imprisonment (21 U.S.C. 841 et seq.; T.C.A. 39-6-401 et seq.). Local ordinances also provide various penalties for drug- and alcohol-related offenses. The university is bound to take all appropriate actions against violators, which may include referral for legal prosecution or requiring the individual to participate satisfactorily in an approved drug use or alcohol abuse assistance or rehabilitation program.

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

# The University of Tennessee Space Institute
# Summer 2016 Course Listings

## AEROSPACE ENGINEERING

| | | | |
|---|---|---|---|
| AE | 500 | Thesis (1-15) | |
| | 002 | CRN 81766 | Abedi |
| | 003 | CRN 81767 | Anusonti-Inthra |
| | 014 | CRN 81778 | Brooks |
| | 004 | CRN 81768 | Majdalani |
| | 005 | CRN 81769 | Moeller |
| | 009 | CRN 81773 | Schmisseur |
| | 010 | CRN 81774 | Solies |
| | 011 | CRN 81775 | Vakili |
| | 013 | CRN 81777 | 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. | 003 | CRN 81781 | 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 | 590 | Selected Engineering Problems (2-6) | |
| SEC. | 001 | CRN 81782 | Abedi |
| | 002 | CRN 81783 | Anusonti-Inthra |
| | 009 | CRN 82069 | Brooks |
| | 003 | CRN 81784 | Majdalani |
| | 004 | CRN 82064 | Moeller |
| | 005 | CRN 82065 | Schmisseur |
| | 006 | CRN 82066 | Solies |
| | 007 | CRN 82067 | Vakili |
| | 008 | CRN 82068 | Zhang |

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

AE 599 Special Topics in AE: Introduction to Non-Intrusive Diagnostics Gas Diagnostics (3)
SEC. 003 CRN 82729
TEXT: J. Michael Hollas, **Modern Spectroscopy**, 4th ed., Wiley, 2004
G.S. Settles, **Schlieren and Shadowgraph Techniques**, Springer, 1949 (2001 printing)—available in the university library. Various other sources provided by instructor
TIME: TBD
PROF: Dr. Trevor Moeller

This is an instructor guided independent-study course that will introduce the engineering student to the wide range of non-intrusive diagnostic techniques available for the characterization of gases. Techniques covered include spectroscopy (atomic, molecular, and Raman), laser diagnostics (PIV, LIF, PLIF, and LIBS), and shadowgraph and schlieren techniques. Each technique will be covered at a level to allow the student to have the knowledge to assess applicability of non-intrusive diagnostics techniques to various applications.

Consent of instructor must be obtained to register.
*Repeatability: May be repeated. Maximum 6 hours.*

AE 600 Doctoral Research and Dissertation (3-15)

| | | | |
|---|---|---|---|
| SEC. | 002 | CRN 81786 | Abedi |
| | 003 | CRN 81787 | Anusonti-Inthra |
| | 016 | CRN 82981 | Brooks |
| | 004 | CRN 81788 | Majdalani |
| | 005 | CRN 81789 | Moeller |
| | 011 | CRN 81795 | Schmisseur |
| | 012 | CRN 81796 | Solies |
| | 013 | CRN 82395 | Vakili |
| | 014 | CRN 82979 | Zhang |

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

AE 599 Special Topics in Aerospace Engineering: Computational Fluid Dynamics I (3)
SEC. 004 CRN 84659 (Same as ME 599 002 CRN 83182)
TEXT: *Applied Computational Aerodynamics: A Modern Engineering Approach*; Russell M. Cummings, William H. Mason, Scot A Morton, David R. McDaniel
TIME: Tuesday & Thursday 3:30 – 6:00 E-110
PROF: Dr. Greg Power

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

laminar/turbulent, steady/unsteady flows, free surface flows, flows with heat transfer and possibly reacting flows).
*Repeatability: May be repeated. Maximum 6 hours.*
*Registration Permission: Consent of instructor.*

**AVIATION SYSTEMS**

AVSY 500 Thesis (1-15)
SEC. 001 CRN 81512 Brooks
002 CRN 81513 Solies

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

AVSY 502 Registration for Use of Facilities (1-15)
SEC. 001 CRN 81532 Brooks
002 CRN 81533 Solies

Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
*Grading Restriction: Satisfactory/No Credit grading only.*
*Repeatability: May be repeated.*
*Credit Restriction: May not be used toward degree requirements.*
*Credit Level Restriction: Graduate credit only.*
*Registration Restriction(s): Minimum student level – graduate.*

AVSY 550 Project in Aviation Systems (3)
SEC. 001 CRN 81536 Brooks
002 CRN 81537 Solies

*Repeatability: May be repeated. Maximum 15 hours.*
*Credit Restriction: Maximum of 3 hours may be applied toward degree requirements.*
*Comment(s): Non-thesis aviation systems majors only.*
*Credit Level Restriction: Graduate credit only.*
*Registration Restriction(s): Minimum student level - graduate.*

**BIOMEDICAL ENGINEERING**

BME 500 Thesis (1-15)
SEC. 010 CRN 82745 Johnson

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

BME 502 Registration for Use of Facilities (1-15)

SEC. 002 CRN 84452

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.*

BME 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 81812 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber; CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Monday, Wednesday & Friday 9:30 – 10:45 E-113
PROF: Dr. Monty Smith

Fundamental concepts of linear algebra to problems in engineering systems: steady state and dynamic systems. Geometric and physical interpretations of relevant concepts: least square problems, LU, QR, and SVD decompositions of system matrix, eigenvalue problems, and similarity transformations in solving difference and differential equations; numerical stability aspects of various algorithms; application of linear algebra concepts in control and optimization studies; introduction to linear programming. Computer projects.
Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

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

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

BME 600 Doctoral Research and Dissertation (3-15)
SEC. 009 CRN 82746 Johnson

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

**CHEMICAL AND BIOMOLECULAR**

CBE 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 81833 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber; CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Monday, Wednesday & Friday 9:30 – 10:45 E-113
PROF: Dr. Monty Smith

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

Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

*Cross-listed: (Same as Biomedical Engineering 529; 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.*

**CIVIL ENGINEERING**

CE 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 83338 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber; CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Monday, Wednesday & Friday 9:30 – 10:45 E-113
PROF: Dr. Monty Smith

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

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

**ELECTRICAL ENGINEERING AND COMPUTER SCIENCE**

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

SEC. 001 CRN 82009 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber; CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Monday, Wednesday & Friday 9:30 – 10:45 E-113
PROF: Dr. Monty Smith

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

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

*Comment(s): Graduate standing or consent of instructor required.*
ECE 600 Doctoral Research and Dissertation (3-15)
SEC. 028 CRN 82039 Bomar

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

**ENGINEERING MANAGEMENT**

EM 500 Thesis (1-15)
SEC. 001 CRN 83205 Simonton
002 CRN 83977 Yu

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

EM 501 Capstone Project (3-6)
SEC. 001 CRN 80003 Simonton
002 CRN 83979 Yu

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

*Grading Restriction: Satisfactory/No Credit grading only.*
*Repeatability: May be repeated. Maximum 6 hours.*
*Comment(s): Requires enrollment in engineering management.*

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

EM 502 Registration for Use of Facilities (1-15)
SEC. 001 CRN 80004 Simonton

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 536 Project Management (3) (Video Recorded)
SEC. 001 CRN 80005 Students participating at Tullahoma classrooms
002 CRN 80006 Students participating by distance ed.
003 CRN 80007 Students participating at Knoxville DE classrooms
TEXT: *Project Management: A Managerial Approach*; Jack R. Meredith, Samuel J. Mantel, Jr.; John Wiley & Sons, Inc.; 8th Edition; ISBN 978-0-470-53302-4
TIME: Tuesday & Thursday 4:00 - 6:35 E-113
PROF: Dr. James Simonton

Development and management of engineering and technology projects. Project proposal preparation; resource and cost estimating; and project planning, organizing, and controlling: network diagrams and other techniques. Role of project manager: team building, conflict resolution, and contract negotiations. Discussion of typical problems and alternative solutions. Case studies and student projects.
*(RE) Prerequisite(s): 537 or consent of instructor.*

EM 600 Doctoral Research and Dissertation (3-15)
SEC. 002 CRN 82296 Simonton
004 CRN 84031 Yu

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

**ENVIROMENTAL ENGINEERING**

ENVE 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 83339 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber; CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Monday, Wednesday & Friday 9:30 – 10:45 E-113
PROF: Dr. Monty Smith

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

linear algebra concepts in control and optimization studies; introduction to linear programming. Computer projects.

Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

*Cross-listed: (Same as Chemical and Biomolecular Engineering 529; Biomedical Engineering 529; Civil Engineering 529, Electrical and Computer 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.*

**INDUSTRIAL ENGINEERING**

IE 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 80105 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber; CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Monday, Wednesday & Friday 10:00 – 11:15 E-113
PROF: Dr. Monty Smith

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

Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

*Cross-listed: (Same as Chemical and Biomolecular Engineering 529; Biomedical 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 603 Design and Analysis of Industrial Experiments (3)
SEC. 001 CRN 84126 (Video Recorded)
TEXT: *Principles of Experimental Design and Analysis*; Alberto Garcia-Diaz and D. T. Phillips; Chapman & Hall, New York, 1995; Recommended Books
*Statistics for Experimenters*, Box, G.E.P., Hunter, J.S. and Hunter, W.G.; John Wiley & Sons.
*The Design and Analysis of Industrial Experiments*, edited by O.L. Davies; Hafner Publishing Company.
*An Introduction to Linear Statistical Models*, Graybill, F.A., McGraw-Hill, 1961.

TIME: Tuesday & Thursday 1:00 – 3:30 E-111
PROF: Dr. Alberto Garcia

Fundamental theory, concepts and procedures required in the efficient design and analysis of industrial experiments. Specific topics discussed include: review of fundamental principles of the design of experiments and ANOVA methodology, introduction to linear statistical models, experimental design models, cross classification models, two-way classification models, mixed models, specialized designs allowing multiple restrictions on randomization with or without replication, orthogonal arrays, symmetric and mixed full and fractional factorial experiments, response surface methodology, and Taguchi methods.
*(DE) Prerequisite(s): 516.*
*Registration Restriction(s): Minimum student level – graduate.*

**MATERIALS SCIENCE AND ENGINEERING**

MSE 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 80150 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber; CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Monday, Wednesday & Friday 9:30 – 10:45 E-113
PROF: Dr. Monty Smith

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

Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

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

**MATHEMATICS**

Math 443 Complex Variables (3)
SEC. 001 CRN 81093 (Video Recorded)
TEXT: *Complex Variables*; Spiegel; Schaum's Outline McGraw Hill
TIME: Monday & Thursday 1:00 – 3:00 E-113
PROF: Dr. Horace Crater

Introduction to the theory of functions of a complex variable, including residue theory and contour integrals.
Theory of functions of complex variable (arithmetic, algebra, and trigonometry); complex differentiation and analytic functions with applications to solutions of Laplaces equations; complex integration, residue theory and

contour integrals with applications to Fourier and Laplace transforms, Fourier Series, and the summation of infinite series; conformal mapping and applications to solving boundary value problems in physics and engineering including applications to fluid and heat flows and electrostatics.
*(RE) Prerequisite(s): 241 or 247.*

**MECHANICAL ENGINEERING**

ME 500 Thesis (1-15)
SEC. 023 CRN 80207 Abedi
024 CRN 80208 Anusonti-Inthra
027 CRN 80211 Majdalani
028 CRN 80212 Moeller
029 CRN 82120 Schmisseur
030 CRN 82121 Solies
031 CRN 82983 Vakili
030 CRN 82984 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 80214 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 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 80216 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber; CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Monday, Wednesday & Friday 9:30 – 10:45 E-113
PROF: Dr. Monty Smith

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

Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors:

characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

*Cross-listed: (Same as Chemical and Biomolecular Engineering 529; Biomedical 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 590 Selected Engineering Problems (2-6)

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| SEC. | 001 | CRN | 80229 | Abedi |
| | 002 | CRN | 80230 | Anusonti-Inthra |
| | 003 | CRN | 80231 | Majdalani |
| | 004 | CRN | 82250 | Moeller |
| | 005 | CRN | 82251 | Schmisseur |
| | 006 | CRN | 82252 | Solies |
| | 007 | CRN | 82253 | Vakili |
| | 008 | CRN | 82254 | Zhang |

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

ME 599 Special Topics in Aerospace Engineering: Computational Fluid Dynamics I (3)
SEC. 002 CRN 83182 (Same as AE 599 004 CRN 84659)
TEXT: *Applied Computational Aerodynamics: A Modern Engineering Approach*; Russell M. Cummings, William H. Mason, Scot A Morton, David R. McDaniel
TIME: Tuesday & Thursday 3:30 – 6:00 E-110
PROF: Dr. Greg Power

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

ME 600 Doctoral Research and Dissertation (3-15)

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| SEC. | 002 | CRN | 80240 | Abedi |
| | 003 | CRN | 80241 | Anusonti-Inthra |
| | 004 | CRN | 80242 | Majdalani |
| | 005 | CRN | 80243 | Moeller |

020 CRN 80258 Schmisseur
025 CRN 80264 Solies
026 CRN 82700 Vakili
028 CRN 82985 Zhang

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

**NUCLEAR ENGINEERING**

NE 529 Applications of Linear Algebra in Engineering Systems (3)
SEC. 001 CRN 83340 (Video Recorded)
TEXT: *Advanced Linear Algebra for Engineers with MATLAB*; Sohail A. Dianat and Eli S. Saber; CRC Press; Latest Edition; ISBN 978-1-4200-9523-4
TIME: Monday, Wednesday & Friday 9:30 – 10:45 E-113
PROF: Dr. Monty Smith

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

Methods of linear algebra with application to engineering problems. Systems of linear equations: matrix-vector notation, solutions to linear equations, determinants, matrix inversion. Vector spaces: spanning sets, orthogonality, matrix decompositions, linear transformations. Eigenvalues and eigenvectors: characteristic polynomials, singular value decomposition. The Cayley-Hamilton theorem: matrix polynomials, functions of matrices. Optimization: least-squares and weighted least-squares methods.

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

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

**PHYSICS**

Phys 500 Thesis (1-15)
SEC. 001 CRN 81265 Davis
003 CRN 81267 Parigger

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

Phys 502 Registration for Use of Facilities (1-15)
SEC. 002 CRN 82363 Davis

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.*

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|---|---|---|---|---|
| Phys | 600 | Doctoral Research and Dissertation (3-15) | | |
| SEC. | 001 | CRN | 81277 | Davis |
| | 003 | CRN | 81279 | Parigger |

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