

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

**THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE
SPRING SEMESTER 2010 COURSE LISTINGS**

AEROSPACE ENGINEERING

AE 512 VISCIOUS FLOWS (3)
SEC. 001 (Videotaped at UTSI)
TIME: Monday & Thursday 1:00 – 2:15 E111
TEXT: F. White: Viscous Flow; 2nd Ed., ISBN# 0-07-069712-4
PROFESSOR: Dr. Ahmad Vakili

Equations of viscous fluid flow; exact and approximate solution; laminar and turbulent flow; transition; separation; boundary layer theories; exact and approximate solution.
Prerequisite: AE 521.

**AE 690 ADVANCED TOPICS IN AE: ADVANCED PERTURBATION
METHODS (3)**
SEC. 002 (Video Recorded)
TIME: Monday 4:00 – 6:35 E111
TEXT: Class Notes
PROFESSOR: Dr. Joseph Majdalani

Objectives: The purpose of this course is to advance students through real life problems requiring the subtle use of asymptotic methods. The goal is to solve problems that arise in propulsion related applications or other fields of science. By the end of the course students will be able to: understand the use of several advanced perturbation techniques; these include: 1) WKB Method (Type I and Type II) with Multiple Distinguished Limits 2) Latta's Method of Composite Expansions 3) Method of Averaging (van der Pol's Method/ Krylov-Bogoliubov Method) 4) Asymptotic Expansion of Integrals (Watson's Lemma) 5) Laplace's Method. Obtain perturbation solutions to complex physical settings involving small or large parameters; understand how to model highly oscillatory solutions; treat partial differential equations; treat problems exhibiting a nonlinear scaling structure; treat compressible flow problems.
Prerequisites: Differential Equations and Perturbation Methods I.

AVIATION SYSTEMS

AS 506 AIRCRAFT DESIGN (3)
SEC. 001 (Cross Listed as AE 599 Section 001) (Video Recorded)
TIME: Tuesday & Friday 1:00 – 2:15 E111
TEXT: D. P. Raymer: Aircraft Design: A Conceptual Approach; AIAA Education Series; 3rd Ed., 1998. ISBN # 1-56347-281-0
PROFESSOR: Dr. U. Peter Solies

Review of air vehicle aerodynamics and performance, design process, compromise of conflicting requirements, economical, industrial, and legal aspects. Definition of mission requirements,

synthesis and optimization techniques, safety and reliability, systems integration, standards and regulations, teamwork and decision-making process.

AS 510 SPECIAL TOPICS: INTRODUCTION TO AVIONICS II (3)

SEC. 001 (Video Recorded)

TIME: Tuesday & Friday 10:30 – 11:45 E113

TEXT: Len Buckwalter: Avionics Training for Systems, Installation and Troubleshooting; Avionics Communications Inc, Latest Edition; ISBN# 1-88-5544-21-9

PROFESSOR: Dr. Alfonso Pujol, Jr.

Avionic systems and communications, including analog and digital systems, distance measuring equipment, transponder, radar altimeter, GPS/satellite navigation, electronic flight instrument system, cockpit voice and flight data recorders, weather detection, traffic alert and collision avoidance system, electrical systems, aviation bands and frequencies, and other topics are also discussed.

AS 510 SPECIAL TOPICS: SYSTEMS ENGINEERING (3)

SEC. 002 (Video Recorded)

TIME: Monday & Thursday 1:30 – 2:45 E113

TEXT: Systems Engineering Principle and Practice; Alexander Kossiakoff and William Sweet; ISBN 0-471-23443-5
Inviting Disaster – Lessons from the Edge of Technology; James R. Chiles; ISBN 0-06-662081-3;
The Secret of Apollo, Systems Management in the American and European Space Programs; Stephen B. Johnson; ISBN 0-8018-8542-6

PROFESSOR: John Muratore

The focus of this course is on engineering problem solving in multi-disciplinary applications with complex systems interactions. Instruction will be provided in methodologies and tools used to deal with large complex systems to deliver system performance that meets user requirements. Methodologies discussed will include system life cycles, requirements development, verification and validation, engineering review processes, hazard analysis, fault trees, reliability block diagrams, system flow diagrams, weight and cost estimating, technical budget management, engineering economic analysis, interface control, and deterministic and monte carlo definition of integrated flight design environments. Special topics will include software integration; interconnect wiring, fault tolerance and redundancy management.

AS 516 Aircraft Flight Controls (Stability and Control)

SEC. 001(Interactive Receive)

TIME: Monday & Thursday 10:30 – 11:30 E111

TEXT: Introduction To Aircraft Flight Mechanics; Yechout, Morris, Bossert, and Hallgren; AIAA Press; 1st Edition; ISBN # 10:1-56347-577-4, ISBN # 13:978-1-56347-577-1.

PROFESSOR: Dr. Andrew Meade

Static and dynamic longitudinal, directional, and lateral stability of aerospace vehicles will be investigated. Topics include:

- Contribution of vehicle components to stability and control
- Motion with fixed and free control surfaces
- Steady flight and maneuvering flight

ENGINEERING MANAGEMENT

EM 533 THEORY AND PRACTICE OF ENGINEERING MANAGEMENT (3)

SEC. 001 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 002 UTSI Students participating elsewhere
SEC. 003 UTK Students participating at Knoxville DE Classrooms
SEC. 004 UTK Students participating elsewhere

TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm

TIME: Thursday 4:00 – 6:35 E113

PROFESSOR: Dr. Gregory Sedrick

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

EM 534 FINANCIAL MANAGEMENT (3)

SEC. 001 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 002 UTSI Students participating elsewhere
SEC. 003 UTK Students participating at Knoxville DE Classrooms
SEC. 004 UTK Students participating elsewhere

TIME: Tuesday 4:00 – 6:35 E113

TEXT: http://www.utsi.edu/academics/ieandem/student_services.htm

PROFESSOR: Dr. Greg Sedrick

Financial and managerial accounting in engineering and technology management. Transaction recording, financial statements, ratios and analysis, activity-based accounting, and standard practices for costing, budgeting, assessment, and control.

EM 541 MANAGING CHANGE AND IMPROVEMENT IN TECHNICAL ORGANIZATIONS (3)

SEC. 001 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 002 UTSI Students participating elsewhere
SEC. 003 UTK Students participating at Knoxville DE Classrooms
SEC. 004 UTK Students participating elsewhere

TIME: Monday 4:00 – 6:35 E113

PROFESSOR: Dr. Denise Jackson

Current topics, theories, and applications for managing change and innovation of performance improvement in organizations. Multi-initiative approaches: quality management, organizational effectiveness, employee empowerment, performance measurement, and application of statistical tools and techniques. Self-assessment for performance excellence. Change agent, team building, and leadership issues. Case studies.

INDUSTRIAL ENGINEERING

IE 514 ADVANCED INFORMATION SYSTEMS ANALYSIS (3)
SEC. 001 All Students participating at Knoxville
SEC. 002 UTK Students participating elsewhere
SEC. 003 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI Students participating elsewhere
TIME: CENTRA
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Xueping Li

Systems analysis and systems control concepts applied to systems of information. Role of IE in office and factory of future. Management support systems, decision support systems, and integrated support systems.

IE 518 ADVANCED ENGINEERING ECONOMIC ANALYSIS (3)
SEC. 001 UTK Students participating at Knoxville DE Classrooms
SEC. 002 UTK Students participating elsewhere
SEC. 003 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI Students participating elsewhere
TIME: Wednesday 4:00 – 6:35 E113
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Joseph Wilck

Application of engineering economic analysis in complex decision situations. Inflation and price changes; uncertainty evaluation using non-probabilistic techniques; capital financing and project allocation; evaluations involving equipment replacement, investor-owned utilities, and public works projects; probabilistic risk analysis including computer simulation and decision trees; multi-attribute decision analysis; and other advanced topics. *Prerequisite: EM537 OR both Engineering Economy (IIE405 or equivalent) and Probability and Statistics for Scientists and Engineers, (IIE205 or equivalent).*

IE 522 OPTIMIZATION METHODS IN INDUSTRIAL ENGINEERING (3)
SEC. 001 All Students participating at Knoxville
SEC. 002 UTK Students participating elsewhere
SEC. 003 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI Students participating elsewhere
TIME: CENTRA
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Charles Aiken

Classical optimization applied to constrained and unconstrained, non-linear, multi-variable functions; search techniques; decision making under uncertainty; game theory; and dynamic programming.

IE 527 LEAN PRODUCTION SYSTEMS (3)
SEC. 001 All Students participating at Knoxville
SEC. 002 UTK Students participating elsewhere
SEC. 003 UTSI Students participating at Tullahoma or Oak Ridge
SEC. 004 UTSI Students participating elsewhere
TIME: CENTRA
TEXT: http://www.utsi.edu/academics/iieandem/student_services.htm
PROFESSOR: Dr. Rupey Sawhney

Characteristics and performance of mass and lean production systems. Lean production concepts and principles. Planning, designing and implementing lean production systems: line balancing, set-up time reduction, cost management, maintenance support and other selected topics. Application at enterprise level to achieve strategic competitive goals. *Prerequisite: 515 or consent of instructor.*

**IE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS
(3)**

SEC. 001(Video Recorded) (Same as CBE/ECE/MSE/ME 529)
TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Taylor and Francis Group, 2009; ISBN-13: 978-1-4200-9524-4 (Hardcover); ISBN-10: 1420095234; List Price: \$99.95.
TIME: Monday & Thursday 9:45 – 11:00 E113
PROFESSOR: 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. *(Same as Biomedical Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529).* *Comment(s): Graduate standing or consent of instructor required.*

Comments: Methods of linear algebra as applied to engineering. Topics to be covered include: systems of linear equations, matrices, solutions of linear equations, Gaussian elimination, vector spaces, linear transformations, orthogonality, least-squares approximations, determinants, eigenvalues and eigenvectors, positive definite matrices, singular value decomposition, and numerical computational methods. Course assignments will consist of pencil-and-paper exercises and numerical exercises involving MATLAB. Students registering for this course are assumed to have access to at least the Student Edition of MATLAB.

MATERIALS SCIENCE

**MSE 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS
(3)**

SEC. 001(Video Recorded) (Same as CBE/ECE/IE/ME 529)
TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Taylor and Francis Group, 2009; ISBN-13: 978-1-4200-9524-4 (Hardcover); ISBN-10: 1420095234; List Price: \$99.95.
TIME: Monday & Thursday 9:45 – 11:00 E113
PROFESSOR: 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. *(Same as Biomedical Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529).* *Comment(s): Graduate standing or consent of instructor required.*

Comments: Methods of linear algebra as applied to engineering. Topics to be covered include: systems of linear equations, matrices, solutions of linear equations, Gaussian elimination, vector spaces, linear transformations, orthogonality, least-squares approximations, determinants, eigenvalues and eigenvectors, positive definite matrices, singular value decomposition, and numerical computational methods. Course assignments will consist of pencil-and-paper exercises and numerical exercises involving MATLAB. Students registering for this course are assumed to have access to at least the Student Edition of MATLAB.

MATHEMATICS

MATH 435 PARTIAL DIFFERENTIAL EQUATIONS (3)

SEC. 002

TIME: Tuesday & Friday 10:30 – 11:45 E111

TEXT: Richard Haberman: Applied Partial Differential Equations with Fourier Services and Boundary Value Problems; Prentice Hall; 4th Ed, ISBN: 013-065243-1

PROFESSOR: Dr. Ken Kimble

Separation of variables, Fourier series, solution of Laplace, wave and heat equations.

Prerequisite: Differential Equations and Calculus III.

MATH 472 NUMERICAL LINEAR ALGEBRA (3)

SEC. 001 (Video Recorded) (Same as CS 472)

TEXT: Burden & Faires: Numerical Analysis; 8th Ed., Brooks/Cole; ISBN: 0-534-38216-9

TIME: Monday & Wednesday 2:30 – 3:45 E111

PROFESSOR: Dr. Trevor Moulden

Direct and iterative methods for systems of linear equations. Solution of single nonlinear equations and nonlinear systems. Orthogonal decomposition, least squares and algebraic eigenvalue problem. *Prerequisite: Numerical Algorithms 1 or consent of instructor. Recommended prerequisite: 453.*

MECHANICAL ENGINEERING

ME 512 HEAT TRANSFER II (3)

SEC. 001

TIME: Tuesday & Friday 1:00 – 2:30 E113

TEXT: Adrain Bejan: Convection Heat Transfer; 2nd Ed., John Wiley & Sons, ISBN# 0471579726

PROFESSOR: Dr. Basil Antar

This course is a continuation of heat transfer, covering convection and thermal radiation heat transfer. *Prerequisite: Mechanical Engineering 511 or consent of instructor.*

ME 522 THERMODYNAMICS II (3)

SEC. 001

TEXT: Richard E. Sonntag, Clalus Borgnakke, and Gorgon J. Van Wylen, Fundamentals of Thermodynamics, 6th Ed., John Wiley & Sons, Inc., 2003, ISBN 0-471-15232-3

TIME: Wednesday & Friday 8:30 – 9:45 E113

PROFESSOR: Dr. Robert McAmis

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, Schrodinger equation.

Prerequisites: 332.

ME 529 APPLICATION OF LINEAR ALGEBRA IN ENGINEERING SYSTEMS (3)

SEC. 001 (Video Recorded) (Same as CBE/ECE/IE/MSE 529)

TITLE: Advanced Linear Algebra for Engineers with MATLAB; Sohal A. Dianat and Eli S. Saber; CRC Press, Taylor and Francis Group, 2009; ISBN-13: 978-1-4200-9524-4 (Hardcover); ISBN-10: 1420095234; List Price: \$99.95.

TIME: Monday & Thursday 9:45 – 11:00 E113

PROFESSOR: 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. (*Same as Biomedical Engineering 529; Industrial Engineering 529; Materials Science and Engineering 529; Mechanical Engineering 529*). *Comment(s): Graduate standing or consent of instructor required.*

Comments: Methods of linear algebra as applied to engineering. Topics to be covered include: systems of linear equations, matrices, solutions of linear equations, Gaussian elimination, vector spaces, linear transformations, orthogonality, least-squares approximations, determinants, eigenvalues and eigenvectors, positive definite matrices, singular value decomposition, and numerical computational methods. Course assignments will consist of pencil-and-paper exercises and numerical exercises involving MATLAB. Students registering for this course are assumed to have access to at least the Student Edition of MATLAB.

ME 581 SPECIAL TOPICS IN AE: ROCKET PROPULSION I (3)

SEC. 001 (Video Recorded) (Same as AE 599 Sec. 002)

TEXT: Rocket Propulsion Elements; George P. and Biblarz, Oscar; Wiley; 7th Edition; ISBN# 041326429.

TIME: Wednesdays 4:00 – 6:35 E111

PROFESSOR: Dr. Joseph Majdalani

Rocket propulsion fundamentals; thermodynamics of non-reacting 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.

PHYSICS

PHYS 512 THEORETICAL PHYSICS II (3)

SEC. 002

TIME: Monday & Thursday 11:15 – 12:30 E113

PROFESSOR: Dr. Horace Crater

Concepts and applications in applied physics. Topics: electrostatic and magneto-static problems, EM waves, duality and quantization, absorption and emission, statistical ensemble and thermal

equilibrium, and other modern applications of current interest, in areas of quantum chemistry, biophysics, optics, spectroscopy and astrophysics.

Recommended Background: Familiarity with computational methods.

PHYS 606 NONLINEAR OPTICS (3)

Sec. 001 (Interactive Video)

TIME: Tuesday & Thursday 8:15 – 9:30 E113

TEXT: TBD

PROFESSOR: Dr. Lloyd David

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

Prerequisite: 521