

Course Schedule - Fall 2006

Theoretical and Applied Mechanics

195 ***Mechanics in the Modern World*** credit: 1 hours.

Freshman introduction to engineering mechanics and its role in modern engineering analysis and design. Lecture project format.

CRN	Type	Section	Time	Days	Location	Instructor
30960	lecture-discussion	U	04:00 PM - 05:20 PM	T	room 105 Talbot Laboratory	Phillips, J
30960: This course is not a Discovery Course this semester.						

199 ***Undergraduate Open Seminar*** credit: 1 to 5 hours.

May be repeated.

CRN	Type	Section	Time	Days	Location	Instructor
10204	independent study		ARRANGED			
10204: Instructor Approval Required						

201 ***Mechanics for Techn and Mgmt*** credit: 3 hours.

Introduction to engineering mechanics (statics, dynamics, solid mechanics, and fluid mechanics) and the role that mechanics plays in engineering analysis and design. Lecture discussion format with laboratory sessions.

Prerequisite: Junior standing in the College of Business.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

206 ***Mechanics for MatSE*** credit: 4 hours.

Topics from statics, mechanics of materials, and fluid mechanics pertinent to the fields of metallurgical engineering, ceramic engineering, and materials science and engineering: force resultants, stresses and strains produced in elastic bodies, microscopic effects of different loading states (tension, compression, torsion, and bending) on deformable bodies, beam stresses and deflections, introduction to three-dimensional stresses and strains, stress and strain-rate relationships for Newtonian and non-Newtonian fluids, conservation equations (control volume analysis) for fluid flow, Reynolds number, and slow inertial and turbulent flows. Course is tailored for students with interests in materials science and engineering. Same as MSE 206. Credit is not given for both TAM 206 and either TAM 251 or TAM 335. Prerequisite: Credit or concurrent registration in MSE 201.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

210 **Introduction to Statics** credit: 2 hours.

Forces, moments, couples; resultants of force systems; equilibrium analysis and free-body diagrams; analysis of forces acting on members of trusses, frames, etc.; shear-force and bending-moment distributions; Coulomb friction; centroids and center of mass; applications of statics in design. Credit is not given for both TAM 210 and TAM 211. Prerequisite: PHYS 211; credit or concurrent registration in MATH 241 (formerly MATH 243) or MATH 242.

Meets with TAM 211. A non-standard term course during the first 2/3 of the term. Students must register for one discussion and one lecture section.

CRN	Type	Section	Time	Days	Location	Instructor
33377	discussion-recitation	ADA	01:00 PM - 01:50 PM	T	room 252 Mechanical Engineering Bldg	Zabiegly, M
33414	discussion-recitation	ADB	09:00 AM - 09:50 AM	M	room 104 Talbot Laboratory	Stone, D
33477	discussion-recitation	ADC	11:00 AM - 11:50 AM	T	room 252 Mechanical Engineering Bldg	Tjan, K
33516	discussion-recitation	ADD	02:00 PM - 02:50 PM	T	room 252 Mechanical Engineering Bldg	Zabiegly, M
34911	discussion-recitation	ADE	02:00 PM - 02:50 PM	R	room 103 Talbot Laboratory	Wilson, S
34922	discussion-recitation	ADF	02:00 PM - 02:50 PM	R	room 252 Mechanical Engineering Bldg	Zabiegly, M
34947	discussion-recitation	ADG	10:00 AM - 10:50 AM	F	room 105 Talbot Laboratory	Wilson, S
34949	discussion-recitation	ADH	09:00 AM - 09:50 AM	T	room 105 Talbot Laboratory	Wilson, S
34951	discussion-recitation	ADI	12:00 PM - 12:50 PM	R	room 104 Talbot Laboratory	Kolinski, J
35219	lecture	AL1	12:00 PM - 12:50 PM	MWF	room 112 Gregory Hall	Ranaweera, M
34954	discussion-recitation	BDA	10:00 AM - 10:50 AM	F	room 104 Talbot Laboratory	Tjan, K
34956	discussion-recitation	BDB	02:00 PM - 02:50 PM	T	room 103 Talbot Laboratory	Wilson, S

34958	discussion-recitation	BDC	02:00 PM - 02:50 PM	T	room 260 Mechanical Engineering Bldg	Stone, D
34961	discussion-recitation	BDD	03:00 PM - 03:50 PM	F	room 103 Talbot Laboratory	Zabiegly, M
34964	discussion-recitation	BDE	09:00 AM - 09:50 AM	R	room 105 Talbot Laboratory	Kolinski, J
34966	discussion-recitation	BDF	10:00 AM - 10:50 AM	R	room 252 Mechanical Engineering Bldg	Tjan, K
35255	discussion-recitation	BDG	12:00 PM - 12:50 PM	R	room 252 Mechanical Engineering Bldg	Stone, D
35262	discussion-recitation	BDH	12:00 PM - 12:50 PM	T	room 103 Talbot Laboratory	Kolinski, J
35273	discussion-recitation	BDI	12:00 PM - 12:50 PM	T	room 105 Talbot Laboratory	Stone, D
35222	lecture	BL1	01:00 PM - 01:50 PM	MWF	room 112 Gregory Hall	Ranaweera, M

211 **Statics** credit: 3 hours.

Forces, moments, and couples; resultants of force systems; equilibrium analysis and free-body diagrams; analysis of forces acting on members of trusses, frames, etc.; shear-force and bending-moment distributions; Coulomb friction; centroids, center of mass, moment of inertia, polar moment of inertia, and product of inertia; virtual work; hydrostatic pressure; applications of statics in design. Credit is not given for both TAM 211 and TAM 210. Prerequisite: PHYS 211; credit or concurrent registration in MATH 241 (formerly MATH 243) or MATH 242.

Students must register for one discussion and one lecture section.

CRN	Type	Section	Time	Days	Location	Instructor
33379	discussion-recitation	ADA	01:00 PM - 01:50 PM	T	room 252 Mechanical Engineering Bldg	Zabiegly, M
33292	discussion-recitation	ADB	09:00 AM - 09:50 AM	M	room 104 Talbot Laboratory	Stone, D
33519	discussion-recitation	ADC	11:00 AM - 11:50 AM	T	room 252 Mechanical Engineering Bldg	Tjan, K
34912	discussion-recitation	ADD	02:00 PM - 02:50 PM	T	room 252 Mechanical Engineering Bldg	Zabiegly, M

33479	discussion-recitation	ADE	02:00 PM - 02:50 PM	R	room 103 Talbot Laboratory	Wilson, S
34923	discussion-recitation	ADF	02:00 PM - 02:50 PM	R	room 252 Mechanical Engineering Bldg	Zabiegly, M
34948	discussion-recitation	ADG	10:00 AM - 10:50 AM	F	room 105 Talbot Laboratory	Wilson, S
34950	discussion-recitation	ADH	09:00 AM - 09:50 AM	T	room 105 Talbot Laboratory	Wilson, S
34952	discussion-recitation	ADI	12:00 PM - 12:50 PM	R	room 104 Talbot Laboratory	Kolinski, J
35220	lecture	AL1	12:00 PM - 12:50 PM	MWF	room 112 Gregory Hall	Ranaweera, M
34955	discussion-recitation	BDA	10:00 AM - 10:50 AM	F	room 104 Talbot Laboratory	Tjan, K
34957	discussion-recitation	BDB	02:00 PM - 02:50 PM	T	room 103 Talbot Laboratory	Wilson, S
34960	discussion-recitation	BDC	02:00 PM - 02:50 PM	T	room 260 Mechanical Engineering Bldg	Stone, D
34963	discussion-recitation	BDD	03:00 PM - 03:50 PM	F	room 103 Talbot Laboratory	Zabiegly, M
34965	discussion-recitation	BDE	09:00 AM - 09:50 AM	R	room 105 Talbot Laboratory	Kolinski, J
34967	discussion-recitation	BDF	10:00 AM - 10:50 AM	R	room 252 Mechanical Engineering Bldg	Tjan, K
35249	discussion-recitation	BDG	12:00 PM - 12:50 PM	R	room 252 Mechanical Engineering Bldg	Stone, D
35258	discussion-recitation	BDH	12:00 PM - 12:50 PM	T	room 103 Talbot Laboratory	Kolinski, J
35268	discussion-recitation	BDI	12:00 PM - 12:50 PM	T	room 105 Talbot Laboratory	Stone, D
35221	lecture	BL1	01:00 PM - 01:50 PM	MWF	room 112 Gregory Hall	Ranaweera, M

212 **Introductory Dynamics** credit: 3 hours.

Kinematics and dynamics of the three-dimensional motion of particles; kinematics and dynamics of the plane motion of rigid bodies; methods of work energy and impulse momentum; moving reference frames. Prerequisite: TAM 210 or TAM 211.

CRN	Type	Section	Time	Days	Location	Instructor
32956	discussion-recitation	AD1	03:00 PM - 03:50 PM	T	room 105 Talbot Laboratory	Morgan, W
32958	discussion-recitation	AD2	01:00 PM - 01:50 PM	R	room 103 Talbot Laboratory	Dare, T
32960	discussion-recitation	AD3	01:00 PM - 01:50 PM	T	room 103 Talbot Laboratory	Dare, T
32962	discussion-recitation	AD4	12:00 PM - 12:50 PM	R	room 105 Talbot Laboratory	Morgan, W
32964	discussion-recitation	AD5	11:00 AM - 11:50 AM	R	room 336 Mechanical Engineering Bldg	Morgan, W
32966	lecture-discussion	AE1	03:00 PM - 03:50 PM	MWF	room 1320 Digital Computer Laboratory	Weaver, R

251 **Introductory Solid Mechanics** credit: 3 hours.

Relationship between internal stresses and deformations produced by external forces acting on deformable bodies, and design principles based on mechanics of solids: normal stresses, shear stresses, and deformations produced by tensile, compressive, torsional, and bending loading of members; beam deflections; elastic energy and impact; multi-dimensional stress states; and buckling of columns. Prerequisite: TAM 210 or TAM 211.

CRN	Type	Section	Time	Days	Location	Instructor
33482	discussion-recitation	AD1	12:00 PM - 12:50 PM	R	room 103 Talbot Laboratory	Johnson, B
33532	discussion-recitation	AD2	03:00 PM - 03:50 PM	R	room 105 Talbot Laboratory	Johnson, B
34913	discussion-recitation	AD3	03:00 PM - 03:50 PM	T	room 104 Talbot Laboratory	Wu, Y
33294	discussion-recitation	AD4	01:00 PM - 01:50 PM	T	room 1105 Siebel Center for Comp Sci	Wu, Y
33381	discussion-recitation	AD5	03:00 PM - 03:50 PM	W	room 4101 Materials Science and Eng Bld	Johnson, B
34924	discussion-recitation	AD6	02:00 PM - 02:50 PM	M	room 104 Talbot Laboratory	Johnson, B

35306	lecture	AL1	09:00 AM - 09:50 AM	MWF	room 103 Talbot Laboratory	Phillips, J
35217	lecture	AL2	10:00 AM - 10:50 AM	MWF	room 103 Talbot Laboratory	Phillips, J

252 **Solid Mechanics Design** credit: 1 hours.

Design problems and projects intended to accompany TAM 251. Primarily for Engineering Mechanics majors. Other students meeting the prerequisites may enroll with consent of instructor. Prerequisite: Credit or concurrent registration in TAM 251; sophomore standing in Engineering Mechanics.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

302 **Engineering Design Principles** credit: 3 hours.

Examples of mechanical design problems that occur in engineering practice and the procedures and issues involved in solving them; technical aspects and societal ramifications of the design process; intellectual property, ethics, and contemporary issues; probability and statistics; computational mechanics; case studies; student discussion of design-related issues at different levels; design project reports and presentations; student teams. Prerequisite: Junior standing in engineering.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

324 **Behavior of Materials** credit: 4 hours.

Same as CEE 300. See CEE 300.

This course satisfies the General Education Criteria for a Advanced Composition course.

Students must register for one lab and one lecture section.

CRN	Type	Section	Time	Days	Location	Instructor
33355	laboratory	AB1	03:00 PM - 04:50 PM	M	room 1225 Newmark Civil Engineering Bldg	Loo, J
33355: Advanced Composition course.						
33375	laboratory	AB2	10:00 AM - 11:50 AM	T	room 1225 Newmark Civil Engineering Bldg	Martinez, A
33375: Advanced Composition course.						
33320	laboratory	AB3	01:00 PM - 02:50 PM	T	room 1225 Newmark Civil Engineering Bldg	Jacobs, D

33320: Advanced Composition course.						
33335	laboratory	AB4	03:00 PM - 04:50 PM	W	room 1225 Newmark Civil Engineering Bldg	LoCicero, A
33335: Advanced Composition course.						
33351	laboratory	AB5	10:00 AM - 11:50 AM	R	room 1225 Newmark Civil Engineering Bldg	Janicki, J
33351: Advanced Composition course.						
35223	lecture	AL1	01:00 PM - 01:50 PM	MWF	room 103 Talbot Laboratory	Struble, L
35223: Advanced Composition course.						

335 **Introductory Fluid Mechanics** credit: 4 hours.

Fluid statics; continuity, momentum, and energy principles via control volumes; ideal and real fluid flow; introduction to the Navier Stokes equation; similitude; laminar and turbulent boundary layers; closed-conduit flow, open-channel flow, and turbomachinery. Lecture/lab format. Prerequisite: TAM 212.

Labs will not meet until the first full week of class. Students must register for one lab and one lecture section.

CRN	Type	Section	Time	Days	Location	Instructor
33316	laboratory	ABA	12:00 PM - 01:50 PM	M	room 126 Talbot Laboratory	Abd El-Rahman, A
33329	laboratory	ABB	08:00 AM - 09:50 AM	M	room 126 Talbot Laboratory	Abd El-Rahman, A
33347	laboratory	ABC	10:00 AM - 11:50 AM	T	room 126 Talbot Laboratory	Mejia Alvarez, R
33357	laboratory	ABD	01:00 PM - 02:50 PM	T	room 126 Talbot Laboratory	Mejia Alvarez, R
33359	laboratory	ABE	03:00 PM - 04:50 PM	T	room 126 Talbot Laboratory	Shank, C
33360	laboratory	ABF	03:00 PM - 04:50 PM	W	room 126 Talbot Laboratory	Shank, C
33361	laboratory	ABG	12:00 PM - 01:50 PM	W	room 126 Talbot Laboratory	Mejia Alvarez, R
33362	laboratory	ABH	03:00 PM - 04:50 PM	M	room 126 Talbot Laboratory	Shank, C
33364	laboratory	ABI	08:00 AM - 09:50 AM	R	room 126 Talbot Laboratory	Bondar, F

35169	laboratory	ABJ	10:00 AM - 11:50 AM	F	room 126 Talbot Laboratory	Bondar, F
35195	laboratory	ABK	01:00 PM - 02:50 PM	R	room 126 Talbot Laboratory	Abd El-Rahman, A
45601	laboratory	ABL	10:00 AM - 11:50 AM	R	room 126 Talbot Laboratory	Bondar, F
35218	lecture	AL1	02:00 PM - 02:50 PM	MWF	room 151 Everitt Elec and Comp Engr Lab	Keane, R

412 **Intermediate Dynamics** credit: 4 hours.

Lagrangian mechanics of dynamical systems with an emphasis on vibrations; constraints and generalized coordinates; motion in accelerating frames; conservation laws and invariance of the Lagrangian; particle motion in one dimension, the two-body problem, and central-force motion; free and forced vibration of linearized single-degree-of-freedom and multi-degree-of-freedom discrete systems; weakly nonlinear vibrations; parametric resonance; introduction to Hamiltonian dynamics; rigid-body motions. Prerequisite: TAM 212; MATH 225 or MATH 415; MATH 385, MATH 386, or MATH 441.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

413 **Fund of Engrg Acoustics** credit: 3 or 4 hours.

Same as ECE 473. See ECE 473.

CRN	Type	Section	Time	Days	Location	Instructor
36982	discussion-recitation	G4	02:00 PM - 02:50 PM	MWF	room 163 Everitt Elec and Comp Engr Lab	O'Brien, W
36982: 4 hours						
36979	discussion-recitation	U3	02:00 PM - 02:50 PM	MWF	room 163 Everitt Elec and Comp Engr Lab	O'Brien, W
36979: 3 hours						

424 **Mechanics of Structural Metals** credit: 3 hours.

Micromechanisms at the atomic, single-crystal, and polycrystal levels and their use in explaining the deformation and failure characteristics of metals; elastic deformation, dislocation mechanics, plastic deformation and strengthening mechanisms, fracture mechanics and fracture mechanisms, fatigue, and creep; design criteria; special topics. Prerequisite: TAM 324/CEE 300 or ME 330; or consent of instructor.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

427 **Mechanics of Polymers** credit: 3 hours.

Mechanical behavior of amorphous and semi-crystalline polymers; overview of polymer structure, properties, and processing; polymer linear viscoelasticity using Boltzmann superposition and mechanical models; measurement of viscoelastic properties; polymeric yield phenomena; fracture and craze formation; impact and fatigue. Same as AE 427. Prerequisite: TAM 324/CEE 300 or ME 330.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

428 **Mechanics of Composites** credit: 3 hours.

Introduction to the behavior of composite materials and their use in engineering structures: behavior and properties of the constituent fibers and matrices, micromechanical predictions of composite properties, anisotropic elasticity, behavior of composite laminae, and classical lamination theory; fracture mechanisms, failure theories; behavior of composite plates and beams. Same as AE 428. Prerequisite: TAM 324/CEE 300 or ME 330.

CRN	Type	Section	Time	Days	Location	Instructor
35291	lecture-discussion	F	02:00 PM - 02:50 PM	MWF	room 103 Talbot Laboratory	Sottos, N

435 **Intermediate Fluid Mechanics** credit: 4 hours.

Analytical solution methods for problems involving ideal and real fluids: potential flow theory, boundary-layer theory; surface waves, vortex dynamics, and compressible flows. Prerequisite: One of TAM 335, ME 310, AE 312; MATH 241 (formerly MATH 243) or MATH 380.

CRN	Type	Section	Time	Days	Location	Instructor
30963	lecture-discussion	A	01:00 PM - 02:50 PM	TR	room 104 Talbot Laboratory	Keane, R

438 **Viscous Flow and Heat Transfer** credit: 4 hours.

Same as AE 412, and ME 411. See AE 412.

CRN	Type	Section	Time	Days	Location	Instructor
36864	lecture-discussion	A	10:00 AM - 11:50 AM	TR	room 335 Mechanical Engineering Bldg	Lee, K

445 **Continuum Mechanics** credit: 4 hours.

Tensor algebra and analysis; kinematics of continua; mass, force, stress, and the general balance laws of continuum mechanics; introduction to constitutive equations. Theoretical and Applied Mechanics students will not receive graduate credit for this course, except by petition to the Graduate Program Committee. Prerequisite: TAM 251; MATH 241 (formerly MATH 243) or MATH 380.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

451 **Intermediate Solid Mechanics** credit: 4 hours.

Analysis of stress and strain (definitions, transformation of axes, equilibrium equations, and symmetry of the stress tensor); linear materials, Hooke's law; strain energy, potential energy, energy principles and methods; two-dimensional problems in elasticity (torsion, axisymmetric problems); the finite-element method for two- and three-dimensional boundary-value problems in linear elasticity; plasticity (introduction, yield criteria, elastic-plastic behavior, and limit-load calculations); linear-elastic fracture mechanics (introduction, Griffith's approach, stress intensity factor, and energy release rate). Prerequisite: TAM 251; MATH 241 (formerly MATH 243) or MATH 380.

CRN	Type	Section	Time	Days	Location	Instructor
30962	lecture	C	10:00 AM - 11:50 AM	MW	room 104 Talbot Laboratory	Johnson, H

456 **Experimental Stress Analysis** credit: 3 hours.

Basic theories for measuring stresses and deformations in load-carrying engineering components; use of optical, electrical, and mechanical instrumentation; laboratory sessions on brittle coatings, electrical resistance strain gages, photoelasticity, and moire interferometry. Lecture lab format. Prerequisite: TAM 251.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

461 **Cellular Biomechanics** credit: 4 hours.

Introduction to the mechanics of biological cells and tissues: cell structure; mechanics of biomembranes; the cytoskeleton and cortex; dynamic cell processes; cell motility and control of cell shape. Same as BIOE 461. Prerequisite: TAM 251 or equivalent.

CRN	Type	Section	Time	Days	Location	Instructor
30961	lecture-discussion	C	10:00 AM - 11:50 AM	TR	room 105 Talbot Laboratory	Freund, J

470 **Computational Mechanics** credit: 3 or 4 hours.

Introduction to modern computational mechanics: mappings and iterative methods; stability; convergence; consistency; numerical and symbolic solutions of ordinary and partial differential equations; finite-difference methods; the finite-element method; spectral methods. Applications to problems in solid mechanics, fluid

mechanics, and dynamics. Same as CSE 450. 3 undergraduate hours. 3 or 4 graduate hours. Graduate students receive 4 graduate hours credit upon successful completion of an additional computational project. Prerequisite: MATH 385, MATH 386, or MATH 441; CS 101.

CRN	Type	Section	Time	Days	Location	Instructor
35028	lecture-discussion	E3	01:00 PM - 01:50 PM	MWF	room 105 Talbot Laboratory	Haber, R
35028: 3 hours						
40082	lecture-discussion	E4	01:00 PM - 01:50 PM	MWF	room 105 Talbot Laboratory	Haber, R
40082: 4 hours						

497 **Independent Study** credit: 1 to 4 hours.

Individual studies in any area of theoretical and applied mechanics. May be repeated to a maximum of 12 hours, with a maximum of 8 hours in any one term. Prerequisite: Advanced undergraduate or graduate standing; consent of instructor.

CRN	Type	Section	Time	Days	Location	Instructor
10211	independent study		ARRANGED			
10211: Instructor Approval Required						

498 **Special Topics** credit: 1 to 4 hours.

Lectures on special topics in selected areas of Theoretical and Applied Mechanics. May be repeated in the same or separate terms as topics vary to a maximum of 9 undergraduate hours or 12 graduate hours. Prerequisite: Senior or graduate standing; see also Schedule or departmental course information.

CRN	Type	Section	Time	Days	Location	Instructor
48105	lecture	GG	ARRANGED			Gioia, G; Kieffer, S
48105: 2 hours						

499 **Senior Thesis** credit: 3 hours.

Thesis investigation of special subjects in mechanics, including theoretical and/or experimental research. 3 undergraduate hours. No graduate credit. Prerequisite: Senior standing; approval of the head of the department.

CRN	Type	Section	Time	Days	Location	Instructor
10208	independent study		ARRANGED			
10208: Instructor Approval Required						

500 **Seminar** credit: 1 hours.

Lectures and discussion on current topics in theoretical and applied mechanics. Required of all graduate students each term. Approved for S/U grading only.

Required for all TAM Graduate Students.

CRN	Type	Section	Time	Days	Location	Instructor
30964	lecture-discussion	X	03:30 PM - 04:50 PM	R	room 103 Talbot Laboratory	Phillips, J

514 **Elastodynamics and Vibrations** credit: 4 hours.

Review of theory of multi-degree-of-freedom systems; problems in the free and forced vibration of continuous linear elastic structures, rods, beams, membranes, plates, and three-dimensional solid and fluid bodies; Lagrangian densities, Sturm Liouville problems, time and frequency domains, damping, Green's functions, and elastic waves; propagation and modal analysis; modeling of damping in structures; and response of complex structures Same as ME 545. Prerequisite: TAM 412, TAM 542, and TAM 551; or equivalents.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

515 **Advanced Physical Acoustics** credit: 4 hours.

Same as ECE 545. See ECE 545.

CRN	Type	Section	Time	Days	Location	Instructor
41048	lecture-discussion	A	01:00 PM - 01:50 PM	MWF	room 170 Everitt Elec and Comp Engr Lab	Oelze, M; O'Brien, W

517 **Stochastic Structural Dynamics** credit: 4 hours.

Same as AE 552. See AE 552.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

518 **Wave Motion** credit: 4 hours.

Linear waves in one-dimensional homogeneous and inhomogeneous media (both solids and fluids), linear elastic waves in a homogeneous halfspace, scalar waves in a layer and in a layered halfspace, nonlinear diffusive waves, nonlinear dispersive waves, and the inverse scattering transform. Prerequisite: TAM 541 or MATH 556 or equivalent; one of TAM 514, TAM 531, TAM 551.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

524 **Micromechanics of Materials** credit: 4 hours.

Advanced analysis of modern engineering materials with emphasis on relating microstructural phenomena to the mechanics of material behavior: prediction of elastic and thermal properties of materials with heterogeneous microstructure (such as composites), micromechanics of failure and damage, toughening mechanisms, mechanics of phase transformations; and current topics in materials research (such as high-temperature response and ferroelasticity). Prerequisite: Undergraduate course in material sciences; TAM 551.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

525 **Advanced Composite Materials** credit: 4 hours.

Same as AE 525. See AE 525.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

526 **Composites Manufacturing** credit: 4 hours.

Same as AE 526 and ME 555. See AE 526.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

529 **Viscoelasticity Theory** credit: 4 hours.

Same as AE 529. See AE 529.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

531 **Inviscid Flow** credit: 4 hours.

Dynamics of fluids in the limit of zero viscosity: governing equations of motion, kinematics, and vorticity transport; general theory of irrotational flow, including two-dimensional potential flow, the complex potential, and three-dimensional potential flow; applications to thin airfoil theory and free streamline theory; inviscid flows with vorticity; vortex dynamics; water wave theory; and aspects of inviscid compressible flow. Prerequisite: TAM 435 or equivalent; MATH 241 (formerly MATH 243) or MATH 380; one of MATH 385, MATH 386, MATH 441.

CRN	Type	Section	Time	Days	Location	Instructor
30965	lecture-discussion	A	10:00 AM - 11:50 AM	MW	room 105 Talbot Laboratory	Pearlstein, A

532 **Viscous Flow** credit: 4 hours.

Dynamics of flow in which viscosity is significant or dominant, and the development and use of theoretical and numerical tools for practitioners of modern fluid mechanics; physics of viscous layers that arise in both high- and low-Reynolds-number flows; dimensional analysis, exact solutions to the Navier-Stokes equations; jets and wakes; microhydrodynamics; fluid stability; and an introduction to turbulence. Prerequisite: TAM 435 or equivalent; MATH 241 (formerly MATH 243) or MATH 380; one of MATH 385, MATH 386, MATH 441.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

536 **Instability and Transition** credit: 4 hours.

Stability of fluid motion: linearized flow equations and normal-mode analysis, Kelvin-Helmholtz instability, inviscid and viscous theory of parallel shear flow, Squire's and Rayleigh's inflection-point theorems, secondary instability theory; critical layers; boundary-layer stability; Orr-Sommerfeld equations, Tollmien-Schlichting waves; non-parallel theory, centrifugal instabilities, and Benard convection; nonlinear theory and transition to turbulence; bifurcations, Landau's theory; routes to chaos, strange attractors; transition modeling, prediction, and control; boundary-layer receptivity, experimental evidence. Prerequisite: TAM 532.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

537 **Experimental Fluid Mechanics** credit: 4 hours.

Methods and techniques for measurement and analysis of data used in experimental fluid mechanics: signal processing, electronics, and electro-optics; fluid mechanical properties; experimental signal processing; random data and signal analysis; analog and digital data processing; dynamic similarity, self-preservation; pressure measurement, thermal anemometry, and laser-Doppler velocimetry; flow visualization, particle-image velocimetry. Lecture/lab format. Prerequisite: TAM 531 or TAM 532.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

538 **Turbulence** credit: 4 hours.

Instability and origins of chaotic motion in fluid flow; Reynolds averaging and statistical description of turbulence, correlations and spectral dynamics of homogeneous turbulence, anisotropic flows, coherent structures, inhomogeneous turbulence, transport models, and large-eddy simulations. Prerequisite: TAM 532.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

30966	lecture-discussion	E	01:00 PM - 02:50 PM	TR	room 105 Talbot Laboratory	Christensen, K
-------	--------------------	---	---------------------	----	----------------------------	----------------

539 **Fluid Mechanics Seminar** credit: 1 hours.

Weekly seminar on current research topics in turbulent and other complex flows: theoretical modeling, numerical analysis, computational techniques, and experimental investigations. Recommended for graduate students in fluid mechanics. Approved for S/U grading only. Prerequisite: Graduate standing in engineering, physics, mathematics, or related field.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

541 **Mathematical Methods I** credit: 4 hours.

Vector and tensor algebra, introduction to complex-variable methods; ordinary differential equations, qualitative questions of existence and uniqueness; analytic solution methods, numerical methods, power-series solution and special functions; eigenvalue problems, Green's functions, Laplace transforms, stability of solutions; engineering applications drawn from mechanics. Prerequisite: MATH 241 (formerly MATH 243) or MATH 380; one of MATH 385, MATH 386, MATH 441.

CRN	Type	Section	Time	Days	Location	Instructor
30968	lecture-discussion	G	03:00 PM - 04:50 PM	MW	room 104 Talbot Laboratory	Gioia, G

542 **Mathematical Methods II** credit: 4 hours.

Continuation of TAM 541. Modeling, inequalities, elements of functional analysis; partial differential equations, existence and uniqueness, second-order equations; hyperbolic conservation laws; numerical methods, eigenfunction expansions, integral transforms, and fundamental solutions; engineering applications drawn from mechanics. Prerequisite: TAM 541.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

545 **Advanced Continuum Mechanics** credit: 4 hours.

Unified treatment of modern continuum mechanics: mathematical preliminaries; review of kinematics and general balance laws; general theory of mechanical constitutive equations, including material constraints and material symmetry. Prerequisite: TAM 551.

CRN	Type	Section	Time	Days	Location	Instructor
47683	lecture-discussion	G	03:00 PM - 04:50 PM	TF	room 100H Talbot Laboratory	Starzewski, M

47683: Additions to course outline: Review of principles, key results and relative advantages of rational continuum mechanics, thermomechanics with internal variables, and rational extended thermomechanics. Introduction to non-classical and/or coupled field theories: classical versus generalized thermoelasticity, quasi-continuum, lattice/particle-based theories, Cosserat-type models of solids and fluids, strain-gradient and non-local models, magnetoelasticity, piezoelectricity, thermodiffusion. Singular surfaces and waves.

549 **Asymptotic Methods** credit: 4 hours.

Advanced methods of perturbation theory and asymptotic analysis, with examples drawn from classical dynamics, fluid mechanics, and wave propagation: asymptotics of integrals, singular perturbation theory (boundary layers, matched asymptotic expansions, and composite expansions), multiple scales, summation of series; special topics. Same as MATH 559, NPRE 559, and PHYS 522. Prerequisite: MATH 446 or equivalent; TAM 541 or equivalent.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

551 **Solid Mechanics I** credit: 4 hours.

Mechanics of elastic deformable bodies, based on the fundamental concepts of modern continuum mechanics: kinematics, balance laws, constitutive equations; classical small-deformation theory; formulation of initial boundary-value problems of linear elastodynamics and boundary-value problems of linear elastostatics; variational formulations, minimum principles; applications of theory to engineering problems. Prerequisite: TAM 251; MATH 241 (formerly MATH 243) or MATH 380; one of MATH 385, MATH 386, MATH 441.

CRN	Type	Section	Time	Days	Location	Instructor
30969	lecture-discussion	E	10:00 AM - 11:50 AM	TR	room 103 Talbot Laboratory	Tortorelli, D

552 **Solid Mechanics II** credit: 4 hours.

Continuation of TAM 551. Selected topics in linear elasticity (including St. Venant beam theory and plane problems of elastostatics), plasticity (including yield surfaces, von Mises and Tresca yield criteria, Drucker's stability postulate, J-flow theory, perfect plasticity, limit analysis, and slip-line theory), and fracture mechanics (including linear elastic analysis, fracture criteria for elastic brittle fracture, and elastic-plastic fracture). Prerequisite: TAM 551.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

554 **Plasticity** credit: 4 hours.

Phenomenological and mathematical formulation of the constitutive laws of plasticity; yield criteria and their experimental verification; plastic stress-strain relations and their associated flow rules; correspondence between rate-independent and rate-dependent plasticity; solutions to basic boundary-value problems, including plane problems and those involving cylindrical and spherical symmetries; variational and minimum principles; limit analysis; plane-strain problems and crystal plasticity; finite-strain theory. Prerequisite: TAM 552.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

555 **Fracture Mechanics** credit: 4 hours.

Unified analytical treatment of modern fracture problems: macroscopic theories used to determine the static strength of bodies containing cracks; Griffith criterion, linear-elastic fracture mechanics, elastic-plastic fracture mechanics models; small-scale yielding results and their implications; general yielding; interfacial fracture; fracture control; micromechanisms of fracture. Prerequisite: TAM 424 or MSE 440; TAM 541; TAM 552.

CRN	Type	Section	Time	Days	Location	Instructor
46525	lecture-discussion	C	10:00 AM - 11:50 AM	TR	room 104 Talbot Laboratory	Sofronis, P

46525: Proposed course outline: Review of principles, key results and relative advantages of rational continuum mechanics, thermomechanics with internal variables, and rational extended thermomechanics. Introduction to non-classical and/or coupled field theories: classical versus generalized thermoelasticity, quasi-continuum, lattice/particle-based theories, Cosserat-type models of solids and fluids, strain-gradient and non-local models, magnetoelasticity, piezoelectricity, thermodiffusion. Singular surface and waves.

570 **Computational Fluid Mechanics** credit: 4 hours.

Highly accurate and reliable techniques for large-scale numerical simulations of fluid flows: spectral numerical methods, including Fourier and other functional expansions, Galerkin and collocation projections, domain decompositions and the solution of partial differential equations, especially the Navier-Stokes equations; high-resolution methods for the solution of hyperbolic conservation laws with discontinuous solutions, and issues related to implementation on supercomputers. Same as CSE 560. Prerequisite: TAM 470 and TAM 542; or equivalents.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

574 **Adv Finite Element Methods** credit: 4 hours.

Advanced theory and applications of the finite-element method, as needed for research in computational science and engineering: applications to mechanics of solids and fluids, thermal problems, etc.; variational foundations of the finite-element method, error estimates, and adaptive analysis; finite-element methods for parabolic and hyperbolic problems; mixed finite-element methods; and applications to systems of equations. Same as CSE 517. Prerequisite: One of TAM 470, CEE 570, CS 455, ME 471, or an equivalent.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

597 **Advanced Independent Study** credit: 1 to 8 hours.

Analytical, experimental, or computational studies in one or more areas of theoretical and applied mechanics, including solid mechanics, behavior of materials, fluid mechanics, dynamics, applied mathematics, and computational science and engineering (Summer session, 1 to 4 graduate hours). Prerequisite: Graduate standing and consent of instructor.

CRN	Type	Section	Time	Days	Location	Instructor
10215	independent study		ARRANGED			
10215: Instructor Approval Required						

598 **Advanced Special Topics** credit: 1 to 4 hours.

Lectures on advanced special areas of Theoretical and Applied Mechanics. May be repeated in the same or separate terms as topics vary to a maximum of 12 hours. Prerequisite: Graduate standing; see also Schedule or departmental course information.

CRN	Type	Section	Time	Days	Location	Instructor
-----	------	---------	------	------	----------	------------

599 **Thesis Research** credit: 0 to 16 hours.

May be repeated. Approved for S/U grading only.

CRN	Type	Section	Time	Days	Location	Instructor
10220	independent study		ARRANGED			
10220: Instructor Approval Required						