CE 1000 – Civil Engineering and Environmental Science Seminar
Fall 2004
Required

2003-2006 Catalog Data: **CE 1000: Civil Engineering and Environmental Science Seminar.** Seminar provides a common meeting time for students and faculty for department activities, such as invited speakers, projects presentations, educational surveys, cross-course project coordination, and policy announcements. Students must enroll every semester that they are matriculated in CEES at OU after the freshman year, but in no case can a student graduate without successfully completing four semesters of seminar. (F, Sp)

Prerequisite: None

Textbook(s) and/or other required material: None

Course Objectives: Expose students to Engineering professionals through interaction with the engineering community.

Coordinator: Varies, School of Civil Engineering and Environmental Science

Prerequisites by Topic: None

Topics: Various

Class/laboratory schedule: One 90-minute lecture per week

Computer Usage: None (except demonstrations)

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
1. Standard course evaluation.

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes
1.1: vii
2.1: v

Relationship of Course to ABET Criterion 3 (a – k):
f, h, i, j

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 1111 – Introduction to Civil Engineering and Environmental Science
Fall 2004
Required

2003-2006 Catalog Data: **1111 Introduction to Civil Engineering and Environmental Science.** Prerequisite: Mathematics 1523. Introduction to fundamental concepts (principles of mechanics, energy balances, simple circuits), problem solving and computing software for civil engineers, environmental engineers, and environmental scientists. (F).

Prerequisite: Mathematics 1523

Textbook(s) and/or other required material: None

Course Objectives: To gain fundamental skills critical to being a successful civil / environmental engineer / scientist, as listed below:

1. Have a basic understanding of civil engineering, environmental engineering, and environmental science issues.
2. Be able to tackle a complex problem by breaking it down into its components and developing solution pathways.
3. Be able to use basic methods (e.g., conservation of mass) and basic tools (e.g. Excel) to analyze components of a complex problem.
4. Effectively work in teams and communicate results in oral and written form using common tools (e.g., Word, Powerpoint).
5. Improve your skill as a self-guided learner.

Coordinator: Dr. David A. Sabatini, Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Mathematics: elementary functions

Topics:
1. Engineering calculations
2. Mass and flow balance
3. Spreadsheets
4. Hydrological processes
5. Presentations with PowerPoint
6. Design of a dam
7. Engineering economics
8. Group dynamics

Class/laboratory schedule: One 75-minute lecture per week

Computer Usage: Spreadsheets and word processing used on various homework assignments.

Design Projects: Determine optimal height of a dam to satisfy multiple constraints of (1) minimum cost of constructing and operating the dam and (2) minimum cost of water purchase if dam height and reservoir volume do not provide sufficient water storage in combination with annual variations of rainfall and runoff.

Laboratory Projects: None

Assessment Methods Used:

2. Standard course evaluation
3. Readiness Assessment Tests (RATs) – individual quizzes on a reading assignment followed by taking the same quiz in the group – promotes self-learning, peer-teaching and group dynamics
4. Peer evaluations

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 0.5 credit hours or 50%
Engineering Design – 0.5 credit hours or 50%

Relationship of Course to Program Outcomes

1.1: ii, vii; 1.2: i, ii, iii; 1.3: i
2.1: iv; 2.2: iii; 2.3: i, ii

Relationship of Course to ABET Criterion 3 (a – k):

a, c, d, e, g

Prepared by: David A. Sabatini **Date**: February 14, 2005

CE 1213 – Computer Applications in Civil Engineering and Environmental Science
Fall 2004
Required

2003-2006 Catalog Data: **CE 1213: Computing Applications in Civil Engineering and Environmental Science.** Prerequisite: Mathematics 2423, Physics 2514 or concurrent enrollment. Introduction to a computer-aided engineering and environmental science. Introduction to application software and tools relevant to civil engineering and environmental science such as Autocad, Java and spreadsheets. (F)

Prerequisites: Mathematics 2423, Physics 2514 or concurrent enrollment.

Textbook(s) and/or other required material:
1. B. V. Liengme, *A Guide to Microsoft Excel 2002 for Scientists and Engineers*, Butterworth-Heinemann, 2002.
2. M. Dix and P. Riley, *Introduction to Autocad 2000*, Prentice-Hall, 2000.
3. S. J. Chapman, *Introduction to Java*, Prentice-Hall, 1999.

Reference: None

Course Objectives: To provide students with a diverse set of computational skills that will help them as students and as practicing civil or environmental engineers or environmental scientists.

Coordinator: Dr. Tohren C. G. Kibbey, Assistant Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic: None

Topics:

1. Spreadsheets (11 classes)
   Introduction to Excel, Entering and working with formulas, Relative vs. absolute references, Filling cells, Formatting spreadsheets, Good spreadsheet practice
   Built-in Functions
      IF (and related functions)
      Engineering/Science/Mathematics functions
      Statistical functions
2. Programming with Java (12 classes)
   Introduction to Java, Basic Elements of Java: variables and constants data types, assignment and mathematical expressions, standard input and output, The structure of a Java program.
3. Scientific/Engineering Graphics with AutoCAD (7 classes)
   Scientific/Engineering Graphics Basics
   AutoCAD Basics, Layers, Dimensioning, Templates

Class/laboratory Schedule: Two 75-minute lectures per week.

Computer Usage: AutoCAD, spreadsheets (Excel), Java (JBuilder)

Design Projects: Vehicle routing problem programming design project.

Laboratory Projects: Multiple in-class programming/computation exercises.

Assessment Methods Used:
1. Standard course evaluation
2. Peer evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 2 credit hours or 67%
Engineering Design - 1 credit hour or 33%

Relationship of Course to Program Outcomes:
1.1: ii, vii; 1.2: ii, iii
2.1: i; 2.2: iii; 2.3: i

Relationship of Course to ABET Criterion 3 (a – k)
a, c, d, e, g, k

Prepared by: Tohren Kibbey **Date:** March 2, 2005

CE 2113 – Statics and Dynamics
Fall 2005
Required

2003-2006 Catalog Data: **2113: Statics and Dynamics (Crosslisted with AME 2113).** Prerequisite: Physics 2514 and Mathematics 2433 or concurrent enrollment in Mathematics 2433. Vector representation of forces and moments; general three-dimensional theorems of statics and dynamics; centroid and moments of area and inertia. Free-body diagrams, equilibrium of a particle and of rigid bodies, principles of work and energy; principle of impulse-momentum. Motion of particles and rigid bodies in translating and rotating reference frames. Newton's law of motion and Lagrange's equation, including application to lumped-parameter systems. (F, Sp, Su)

Prerequisite: Physics 2514 and Math 2433 or concurrent enrollment in 2433

Textbook(s) and/or other required material:

1. *Vector Mechanics for Engineers - Statics*, by Ferdinand B. Beer and E. Russell
2. Johnston, Jr., 7th ed., 2004, with accompanying workbook (ISBN 0073130877), McGraw-Hill Book Co.

Course Objectives: General: To develop an analytical and methodic approach to solving relatively simple mechanical problems: i.e. the ability of reducing the mechanical problem at hand to an idealized mathematical model and applying relevant theoretical concepts and methods to arrive at the desired solution.

Selected topics: To develop the ability to operate on force and moment vectors to obtain resultants or components; Develop an understanding of equilibrium of forces and free-body-diagrams; Introduce to the students the analysis of simple structures; Introduce frictional forces; Develop ability to obtain centroid and moment of inertia of areas; Introduce certain aspects of kinematics and kinetics of particles, if time permits.

Coordinator: Dr. Kianoosh Hatami, Assistant Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:

1. Calculus
2. Physics

Topics:

1. Force resultants and resolution of forces into components
2. Rectangular components of a force, Unit vectors, Addition of forces
3. Equilibrium of a particle, Free-body diagrams
4. Rectangular components of a force in space, Equilibrium of a particle in space
5. Vector product of two vectors, Moment of a force about a point, Varignon's theorem
6. Scalar product of two vectors, Mixed product of vectors

7. Moment of a force about a given axis, Moment of a couple
8. Equivalent systems of forces, Reduction of a system of forces to a wrench
9. Equilibrium of rigid bodies in two dimensions
10. Spring Break
11. Equilibrium of rigid bodies in three dimensions
12. Centroids and Centers of Gravity, Distributed Loads on Beams
13. Analysis of trusses by the method of joints and sections
14. Analysis of frames
15. Problems involving friction
16. Moments of inertia

Schedule: Three 50 minute lectures per week

Computer Usage: Matlab, spreadsheets and word processing used for various homework assignments

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
5. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 3 credit hours or 100%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes
1.1: ii

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 2153 - Mechanics of Materials
Spring 2005
Required

2003-2006 Catalog Data: **2153: Mechanics of Materials.** Prerequisite: 2113. Basic principles of mechanics, including the definition of stress and strain, transformations and principal values for the stress and strain tensors, kinematics relations, review of conservation equation and the development and application of constitutive laws for idealized materials. Elementary elasticity and Hooke's law; Poisson's ratio; solution of elementary one- and two-dimensional statically indeterminate problems; stresses and strains due to temperature changes; stresses induced by direct loading, bending and shear; deflection of beams; area-moment and moment distribution; combined stresses; structural members of two materials; columns. (F, Sp)

Prerequisite: CE 2113

Textbook(s) and/or other required material:
1. Gere and Timoshenko, *Mechanics of Materials*, 3rd Edition, PWS-Kent Publishing Co., 1984

Course Objectives: Understand analysis and design of members subjected to axial loading, shear, torsion, and bending stress, strain, strength behavior.

Coordinator: Dr. Musharraf Zaman, David Ross Boyd Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Statics and equilibrium
2. Properties of areas and volumes
3. Free-body diagrams

Topics:
1. Review of statics
2. Concepts of stress and strain
3. Hooke's Law and linear elasticity
4. Modulus of elasticity
5. Stress, strain and deflection of axially loaded members
6. Shear stress and strain
7. Shear modulus
8. Torsional stress and strain
9. Pure shear

10. Torsional deformations
11. Power transmission in circular shafts

12. Beams
13. Shear and bending moments diagrams
14. Bending stresses and strains in beams
15. Composite beams
16. Shear stresses in beams
17. Transformation of plane stress
18. Principal stresses and strains
19. Mohr's circle
20. Pressure vessels
21. Deflection of beams
22. Beam deflections by integration
23. Statically indeterminate structures
24. Columns and Euler's stability

Class/laboratory schedule: Two 75-minute lectures per week.

Computer Usage: Spreadsheets

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hour or 0%
Engineering Science - 2.5 credit hour or 84%
Engineering Design - 0.5 credit hour or 16%

Relationship of Course to Program Outcomes
1.1:ii, vii

Relationship of Course to ABET Criterion 3 (a – k):
a, c ,e, k

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 2223 – Fluid Mechanics
Spring 2005
Required

2003-2006 Catalog Data: **2223: Fluid Mechanics.** Prerequisites: 2113, Environmental Science 2313, Mathematics 2433 and concurrent enrollment in Mathematics 3113. Coverage of the fundamentals of fluid statics and dynamics. Formulation of the equation of fluid flow, i.e., Navier-Stokes equations, Eulers equations, Bernoulli equations, etc. and their application. Examples of ideal fluid flow and viscous fluid flow, such as flow in open and closed conduits. (Sp)

Prerequisites: Mathematics 2433, and concurrent enrollment in Mathematics 3113
(Note: Environmental Science 2313 is not required in the Architectural Engineering Program)

Textbook(s) and/or other required material:
Potter, M.C.; Wiggert, D. C. *Mechanics of Fluids*, 3rd Edition, Brooks/Cole, 2002

Course Objectives: To provide students with an understanding of fundamentals of fluid statics and fluid motion, with emphasis on engineering applications.

Coordinator: Dr. Tohren C. G. Kibbey, Assistant Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic: None

Topics:
1. Introduction/Basic Considerations (1cl.)
2. Fluid Statics: forces on plane and curved surfaces, buoyancy, stability, linearly accelerating containers (4 cl.)
3. Fluids in Motion/Integral Forms: introduction, Bernoulli equation, conservation of mass, energy equation, momentum equation (5 cl.)
4. Dimensional Analysis and Similitude (3 cl.)
5. Internal Flow: Introduction, laminar flow, Turbulent flow in pipes, Minor losses (5 cl.)
6. External Flow: Introduction, drag and lift, boundary layer theory (3 cl.)
7. Open Channel Flow (2 cl.)
8. Compressible Flow (2 cl.)
9. Piping Systems (2 cl.)

Class/laboratory schedule: Two 75-minute lectures per week.

Computer Usage: Spreadsheets

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:

1. Standard course evaluation

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 2.5 credit hours or 83%
Engineering Design – 0.5 credit hours or 17%

Relationship of Course to Program Outcomes:

1.1:ii, vii
2.3:i

Relationship of Course to ABET Criterion 3 (a – k):

a, c, d, e

Prepared by: Tohren Kibbey **Date:** March 2, 2005

CE 3213 – Water Resources Engineering
Fall 2004
Required

2003-2006 Catalog Data: **CE 3213: Water Resources Engineering.** Prerequisite: 2223. Municipal water demands, surface water hydrology, ground water hydrology, water distribution systems, pump design, wastewater collection systems, storm water management, water law. (F)

Prerequisites: CE 2223

Textbook(s) and/or other required material:
Water Resources Engineering, D. A. Chin, Prentice-Hall, 2000

Course Objectives: Introduce the student to selected topics in water resources engineering, including the following: hydrology, hydraulics, water supply and distribution, pump design, wastewater collection, and storm water management. Students must demonstrate both a conceptual understanding and familiarity with practical design tools. All major concepts will be presented in the context of designing infrastructure elements for Sooner City. In order to successfully complete the project and the course, students must not only master the technical material, *they must also develop the critical thinking skills necessary to handle open-ended design problems*, including analyzing and assessing multiple alternatives. Since infrastructure design spans many sub-disciplines of civil and environmental engineering, we will require students to collaborate, via the web or formal memos or common meetings, with other CEES classes working on similar aspects of the design.

Coordinator: Dr. Randall L. Kolar, Associate Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic: Fluid Mechanics

Topics:
1. Introduction to water resources engineering
1. Municipal water demands
2. Sources of water
3. Basic surface water hydrology and the water budget
4. Basic ground water hydrology and well hydraulics
6. Design of water distribution systems
7. Pump analysis & design (system curves, pumps in parallel & series)
8. Quantities of waste
9. Open channel hydraulics
10. Design of sanitary sewers

11. Urban hydrology & design of storm sewers
12. Introduction to water law

Class/laboratory schedule: Two 50-minute classes per week; one 120-minute computer/problem solving laboratory

Computer Usage: Most homework assignments require the use of spreadsheets to solve problems. Tasks for the design project requires solution of simultaneous nonlinear equations, so students use academic editions of commercially-available software, such as Haestad Methods CAD products. Graphics and word processing needed for reports.

Design Projects: Sewer and water infrastructure for the city, including pump design.

Laboratory Projects: None

Assessment Methods Used:
1. Standard course evaluation.
2. Reflective writing assignments
3. Review of course technology submittal
4. Peer evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 1 credit hour or 33%
Engineering Design – 2 credit hours or 67%

Relationship of Course to Program Outcomes:
1.2: i, iii; 1.3: i
2.1: ii, iv; 2.2: iii, vi; 2.3: i, ii

Relationship of Course to ABET Criterion 3 (a – k):
a, c, d, e, g, i, j, k

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 3243 – Water and Wastewater Treatment Design
Spring 2005
Required

2003-2006 Catalog Data: **3243: Water and Wastewater Treatment Design.** Prerequisite: 2223, 3213, and ES 2313. Design of municipal water and wastewater treatment plants. Emphasis is placed on the characterization of water and wastewater and physical, chemical and biological treatment methods. Sludge processing, advanced treatment methods and treatment plant hydraulics are also considered. **Laboratory** (Sp)

Prerequisite: CE 2223, CE 3213, and ES 2313

Textbook(s) and/or required material:

M. Hammer and M.J. Hammer, *Water and Wastewater Treatment Technology*, 5th Ed., Prentice Hall, 2004 (ISBN: 0-13-097325-4)

Course Objectives: Evaluate a scenario requiring water or wastewater treatment and draw an appropriate process flow schematic for full-scale treatment of the water or wastewater being evaluated. The contaminants removed and residuals produced by each operation or process must also be identified in all schematics; formulate reactor design equations by implementing mass balance concepts and integrating them with simple chemical and biological kinetic expressions, as appropriate; professionally convey engineering design calculations using a written format; apply established equations and approaches to the design of the water and wastewater operation/process. Laboratory

Coordinator: Dr. Keith A. Strevett, Associate Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Calculus
2. General chemistry
3. General physics
4. Fluid mechanics
5. Material Balance
6. Water Resources

Topics:
1. Introduction: Materials Balance; Example Problems
2. Water Treatment: Overview and Water Chemistry; Example Problems
3. Reaction Kinetics; Water Quality; Example Problems
4. Coagulation and Softening; Reactors; Example Problems
5. Mixing and Flocculation; Example Problems
6. Sedimentation and Filtration; Example Problems
7. Disinfection and Adsorption; Example Problems
8. Wastewater Treatment: Design Overview; Microbiology
9. Wastewater Treatment: Water Quality Indicators

10. Spring Break
11. Pretreatment Treatment; Example Problems
12. Primary Treatment; Example Problems
13. Secondary Treatment-Suspended; Example Problems
14. Secondary Treatment-Fixed; Example Problems
15. Tertiary Treatment; Example Problems
16. Sludge Treatment; Sludge Disposal; Example Problems

Class/laboratory schedule: Two 120-minute lectures and one 120-minute laboratory session per week

Computer Usage: WaterPro, spreadsheets and word processing used on various homework assignments and laboratory reports.

Design Projects: Two design projects that relate to the Sooner City concept. The first design is a water treatment plant. The second design is a wastewater treatment plant design. Teams of three or four will work closely together and complete designs. Final designs are submitted in written form as well as a summary presentation given by the groups.

Laboratory Projects:
1. Water Treatment Plant (1 week) and Wastewater Treatment Plant (1 week) Visit
2. Water Chemistry: pH Measurement, Conductivity, Turbidity, Alkalinity, Hardness (2 weeks)
3. Water Treatment Design I: Coagulation, Flocculation (1 week)
4. Water Treatment Design II: WaterPro Disinfection Design (1 week)
5. Wastewater Quality: BOD, COD, ThOD, Oxygen Update (2 week)
6. Wastewater Treatment Design: Oil-Water Clarifier (4 weeks)
7. Required participation in ASCE Brown-Bag Presentations (3 weeks)

Assessment Methods Used:
1. Standard course evaluation
2. Review of course written submittal
3. Peer evaluations
4. Review of course technology submittal

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 1 credit hours or 33%
Engineering Design - 2 credit hours or 67%

Relationship of Course to Program Outcomes:
1.2: i, ii, iii; 1.3: i
2.1: ii, iv; 2.2: iii; 2.3: i, ii

Relationship of Course to ABET Criterion 3 (a – k):
a, b, c, d, e, f, g, j, k

Prepared by: Keith A. Strevett **Date:** January 14, 2005

CE 3253 – Introduction to Continuum Mechanics
Fall 2004
Required

2003-2006 Catalog Data: **3253: Introduction to Continuum Mechanics.** Prerequisite: 2113, 2153, Physics 2524 and Mathematics 3113. Mechanics of a deformable continuum, including applications of plane stress, plain strain and an introduction to three-dimensional elatostatics. Thermodynamics of deformable media, including energy formulations suitable for closed-form applications and for computational approximations. Constitutive relations for engineering materials, including nonlinear stress-strain relations and multi-physics problems with coupling of the behavior of solids and fluids within the framework of poromechanics. Considerations for structural mechanics, micromechanics and nanomechanics. (F)

Prerequisites: CE2113, CE2153, PHYS2524 and MATH3113

Textbook(s) and/or other required material:
Fung, Y.C. (1994) "First Course in Continuum Mechanics" (third edition) Prentice Hall, Englewood Cliffs, New Jersey.

Course Objectives: All natural and man-made systems obey certain physical laws. As engineers it is important to understand these physical laws and find ways to rigorously describe various natural and man-made materials. This course is designed to show how to describe the behavior of various systems made of solids, fluids, and gases using precise mathematical statements.

Coordinator: Dr. K.K. Muraleetharan, Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic: Statics, Dynamics, Strength of Materials, Ordinary Differential Equations

Topics:
1. Mathematical Preliminaries
2. Stress
3. Deformation and Strain
4. Motion
5. Constitutive equations
6. Derivations of field equations
7. Structural mechanics
8. Poromechanics
9. Biomechanics
10. Nanomechanics.

Class/laboratory schedule: Three 50-minute lectures per week.

Computer Usage: A structural mechanics finite element computer code

Design Projects: Design of a pressure vessel using a finite element computer code

Laboratory Projects: None

Assessment Methods Used:

3. Standard course evaluation

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 3 credit hours or 100%
Engineering Design - 0 credit hour or 0%

Relationship of Course to Program Outcomes:

1.1:ii, vii
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):

a, c, e, k

Prepared by: K.K. Muraleetharan **Date**: May 14, 2005

CE 3334 – Measurements In CEES
Spring 2005
Required

2003-2006 Catalog Data: **3334: Measurements In CEES.** Prerequisite: Mathematics 2423, Physics 2524, Chemistry 1415, and Environmental Science 2313. Introduction to measurement (laboratory and field) techniques, data analysis, and interpretation and applications to civil and environmental engineering and environmental science problems. Topics include statistics, land surveying, remote sensing, GIS, environmental sampling and analysis, and sensors. **Laboratory** (Sp)

Prerequisites: Mathematics 2423, Physics 2524, Chemistry 1415
(Note: Environmental Science 2313 is not required in the Architectural Engineering Program)

Textbook(s) and other required material:
Course Packet

Course Objectives: To provide students with awareness of space and of methodologies to measure distance, elevation, direction, and description of these features.

Coordinator: Dr.Baxter E. Vieux, Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
Mathematics 2423
Physics 2524
Chemistry 1415

Topics:
Weeks 1-4, Test 1
1. Measurements and statistics
2. Probability concepts
3. Confidence Intervals
4. Standard error and Specifications

Weeks 5-9, Test 2

5. Topographic Mapping
6. GPS measurements of horizontal and vertical measurement
7. Working with coordinates and GIS

Weeks 9-14

8. Environmental Sampling
9. Calibration of Sensors
10. Term project

Class/laboratory schedule: Two 50-minute lectures twice per week

Computer Usage: Computer exercises for data analysis, GIS and statistical analysis

Design Projects: Term project involves data analysis and report writing

Laboratory Projects:
1. Statistics and repeated measurements
2. Calipers and measurement uncertainty
3. Differential leveling
4. GPS and acquisition of horizontal and vertical data
5. GIS mapping and evaluation of data sources
6. Topographic mapping
7. Environmental sampling

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 2 credit hours or 50%
Engineering Design – 2 credit hours or 50%

Relationship of Course to Program Outcomes:
1.1:ii, v
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, b, c, e, g, k

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 3364 - Soil Mechanics
Fall 2004
Required

2003-2006 Catalog Data: **3364: Soil Mechanics.** Prerequisite: CE2223, CE3403. General treatment of the physical and mechanical properties of soils. Theories of lateral earth pressure, consolidation, bearing capacity, slope stability and groundwater flow. **Laboratory** (F)

Prerequisites: CE2223, CE3403

Textbook(s) and/or other required material:
Braja Das, *Principles of Geotechnical Engineering*, 3rd Ed., PWS, 1993

Course Objectives: To provide students with an understanding of the fundamental behavior of soil with regard to applications in geotechnical engineering.

Coordinator: Dr. Gerald A. Miller, Associate Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Fluid Mechanics
2. Materials

Topics:
1. Soil phase relationships
2. Index properties of soil
3. Soil classification
4. Soil compaction
5. Permeability and seepage, flow nets
6. Total, effective and neutral stresses in soils
7. Stresses in soils; Boussinesq, Newmark, and induced stresses by various types of surface loads
8. Consolidation and settlement
9. Shear strength of soil, direct shear, unconfined and triaxial compression tests; influence of water presence, p-q diagrams
10. Lateral earth pressure; active, at rest, passive; effect of surcharge loads
11. Slope stability—method of slices
12. Soil bearing capacity—Terzaghi's method, granular vs. fine-grained soils

Class/laboratory schedule: Three 50-minute lectures and one 170 minute laboratory session per week.

Computer Usage: Spreadsheets, graphing software

Design Projects: Semester long “Sooner City” Earth Dam design project.

Laboratory Projects:

1. Laboratory tour/slide show on Geotechnics
2. Soil identification/phase relationships - ASTM D2488
3. Soil classification - ASTM D2487, D422, D4318
4. Soil survey exercise
5. Soil compaction - ASTM D698, D1557
6. Permeability and seepage
7. Video seminar (deep dynamic compaction, trenchless technology)
8. Oedometer test - ASTM D2435
9. Geotechnical exploration exercise
10. Direct shear test - ASTM D3080
11. Unconfined compression test - ASTM D2166
12. Triaxial compression test - ASTM 4767
13. Geosynthetics seminar

Assessment Methods Used:

1. Standard course evaluation
2. Review of course written submittals
3. Peer evaluation

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 2.5 credit hours or 83%
Engineering Design – 0.5 credit hours or 17%

Relationship of Course to Program Outcomes:

1.1: i, v, vi; 1.2: i, ii, iii; 1.3: i
2.1:iv; 2.3:i, ii

Relationship of Course to ABET Criterion 3 (a – k):

a, b, c, e, f, g

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 3403 - Materials
Spring 2005
Required

2003-2006 Catalog Data: **3403: Materials.** Prerequisite: Chemistry 1415, corequisite of 2153. Study of the properties of materials utilized by civil engineers; analyses of aggregates, concrete, masonry, steel, asphalt, and wood**. Laboratory** (Sp)

Prerequisites: Chemistry 1415

Textbook(s) and/or other required course material:
1. *Basic Construction Materials*, T.W. Marotta, 7th Ed., Prentice Hall, 2005
2. *The New Science of Strong Materials*, J.E. Gordon, Princeton University Press, 1976

Course Objectives: Graduates will understand the behavior of common civil engineering materials.

Coordinator: Dr. J. Pei, Assistant Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Principles of static equilibrium and strength of materials

Topics:
1. Basic tests of aggregate
2. Properties of aggregate for concrete
3. Types of Portland cement
4. Proportioning of concrete mixtures
5. Tests of concrete qualities
6. Masonry vocabulary and terminology
7. Properties of brick, mortar and masonry assemblies
8. Crystal structure, impurities, and alloys in steel
9. Steel manufacturing processes and terminology
10. Effects of heat treatment and cold working on steel
11. Typical structural and reinforcing steels
12. Wood terminology, properties, and grading
13. Elastic buckling of slender columns

Class/laboratory schedule: Two 50-minute lectures per week and one 100-minute laboratory session per week

Computer Usage: Used in laboratory for data acquisition and encouraged for data analysis and report writing.

Design Projects: None

Laboratory Projects:
1. Sieve analysis of aggregate
2. Testing of cement mortar cubes
3. Testing of brick, mortar, and brick prisms
4. Tensile testing of steel and aluminum
5. Testing of wood specimens
6. Testing of asphalt cement
7. Demonstration of elastic buckling

Assessment Methods Used:
1. Standard course evaluation
2. Review of course written submittals

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 3 credit hours or 100%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:
1.1:ii, v, vii; 1.2: i, iii
2.1:iv; 2.2:iii; 2.3: i, ii

Relationship of Course to ABET Criterion 3 (a – k):
a, b, c, e, g, j

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 3414 - Structural Analysis I
Fall 2004
Required

2003-2006 Catalog Data: **3414: Structural Analysis I.** Prerequisite: Engineering 1213 and 2153. Loads, reactions and force systems; introduction to design codes; analysis of frames and trusses; calculation of structural deformations; and analysis of indeterminate structures. Emphasis on classical solutions and time-tested approaches to structural engineering. Introduction to structural analysis computer programs to solve complex problems. (F)

Prerequisites: CE 1213 and CE 2153
(Note, ENGR 1213 and ENGR 2153 replaced by CE 1213 and CE 2153)

Textbook(s) and/or other required material:
R.C. Hibbeler, *Structural Analysis*, 5th edition Prentice Hall, 2002

Course Objectives: Students will be able to analyze structures utilizing classical methods.

Coordinator: Dr. Jin-Song Pei, Assistant Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Rigid body mechanics
2. Mechanics of deformable bodies
3. Background in vectors, matrices and differential equations

Topics:
1. Classifications of structures and loads
2. Shear, thrust, and bending moments for beams and frames
3. Determinate trusses
4. Deflection of beams, frames and trusses
5. Introduction to matrix methods for determinate beams, frame and trusses
6. Analysis of indeterminate structures by consistent deformation, slope deflection and moment distribution
7. Approximate methods for analysis of indeterminate structures
8. Influence lines for determinate structures

Class/laboratory schedule: Two 100-minute lectures per week

Computer Usage: None

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:

1. Standard course evaluation
2. Review of course technology submittals

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 4 credit hours or 100%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:

1.1:i

Relationship of Course to ABET Criterion 3 (a – k):

a, c, e, k

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 3663 - Structural Design–Steel I
Fall 2004
Required if not taken CE 3673 – Concrete I

2003-2006 Catalog Data: **3663: Structural Design–Steel I.** Prerequisite: 3403, 3414. Design of steel structural members including tension elements, columns, beams and beam-columns; bolted and welded connection design; introduction to plastic design. **Laboratory** (F)

Prerequisites: CE 3403, CE 3414.

Textbook(s) and/or other required material:
Jack C. McCormac, *Structural Steel Design*, Harper & Row, 1989

Course Objectives: Students will be able to analyze and design simple structures of steel.

Coordinator: Mr. Chris Ramseyer, Instructor/Graduate Student, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Statics
2. Strength of materials
3. Methods of determinate and indeterminate structural analysis

Topics:
1. Structural steels and specifications
2. Design of tension members
3. Design of compression members
4. Design of column base plate
5. Design of laterally supported beams
6. Design of laterally unsupported beams
7. Design of beam-columns
8. Design and analysis of bolted connections
9. Design and analysis of welded connections

Class/laboratory schedule: Three 50 minute lecture periods per week and one 100-minute laboratory period week

Computer Usage: Development of spreadsheet programs is required for some homework.

Design Projects: Design of a moderate-sized braced steel building frame

Laboratory Projects:
1. Open discussion
2. Homework help session

3. Project help and work sessions

Assessment Methods Used:

1. Standard course evaluation
2. Review of course written submittals
3. Review of course technology submittals

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 1 credit hour or 33%
Engineering Design - 2 credit hours or 67%

Relationship of Course to Program Outcomes

1.1:i, iv, v; 1.2:i, ii, iii; 1.3: i
2.1:iv; 2.3: i, ii

Relationship of Course to ABET Criterion 3 (a – k):

a, c, e, g, j, k

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 3673 - Structural Design–Concrete I
Spring 2005
Required if not taken CE 3663 – Steel I

2003-2006 Catalog Data: **3673: Structural Design–Concrete I.** Prerequisite: 3403, 3414. Analysis and design of reinforced concrete beams, columns, slabs, footings, etc., along with discussion of current building practice. **Laboratory** (Sp)

Prerequisites: CE 3403, CE 3414

Textbook(s) and/or other required material:
1. E.G. Nawy, *Reinforced Concrete (5th Ed.)*
2. ACI, *Building Code Requirements for Structural Concrete (318-02)*

Course Objectives: Students will gain the ability to analyze and design simple structures of reinforced concrete.

Coordinator: Mr. Chris Ramseyer, Instructor/Graduate Student, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Knowledge of concrete and steel material properties
2. Knowledge of structural analysis

Topics:
1. Material properties and specifications, design philosophies
2. Beams, flexural behavior and design
3. Shear
4. Columns
5. Serviceability
6. Development of Reinforcement

Class/laboratory schedule: Two 75 minute lecture periods per week and two 50-minute laboratory sessions per week

Computer Usage: None required, use of spreadsheets encouraged.

Design Projects: None

Laboratory Projects: The laboratory sessions are intended for demonstrations.

Assessment Methods Used:
1. Standard course evaluation.
2. Review of course written submittals

3. Review of course technology submittals

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 1 credit hour or 33%
Engineering Design - 2 credit hours or 67%

Relationship of Course to Program Outcomes
1.1:i, iv, v, vi; 1.2: i, ii, iii; 1.3: i
2.1:iv; 2.3: i, ii

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, g, j, k

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 3884 - Transportation Engineering
Spring 2005
Required

2003-2006 Catalog Data: **3884 Transportation Engineering.** Prerequisite: 2553, 3363. Introduction to transportation planning, design, construction, operations and maintenance, emphasizing the highway/street mode. Includes demand modeling, route location and design, pavements including hot mix asphalt volumetrics and stability, drainage and traffic control devices. **Laboratory** (Sp)

Prerequisites: CE 2553 and CE 3364
(Note, CE 3363 course number was changed to CE 3364)

Textbook(s) and/or other required material:
Wright, *Highway Engineering*, 1996

Course Objectives: This course will introduce fundamental transportation engineering concepts, apply previously learned material (such as statistics) to transportation, and prepare students for more advanced transportation concepts in subsequent classes.

Coordinator: Dr. Joakim G. Laguros, David Ross Boyd Professor Emeritus, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Surveying
2. Materials
3. Soils

Topics:
Week 1-4, Test No. 1
1. Roadway agency administration and policies
2. Fundamental characteristics of system elements
3. Transportation planning—trip generation, distribution, mode choice, assignment, capacity
4. Geometric design—alignment, cross section, design controls
5. Traffic operations—traffic control devices, fundamental traffic signal considerations

Week 5-8, Test No. 2
6. Drainage facilities open channel and culverts, surface and subsurface drainage
7. Surveys, selection of route location, calculation of earthwork
8. Review of aggregate, soils and bituminous material characteristics
9. Flexible pavement design using the California, AI methods

Week 9-14, Final Comprehensive
10. Material characteristics of bases and subbases and subgrades, soil stabilization methods and mix designs

11. Compaction characteristics including control
12. Construction features of low-cost and high-cost bituminous pavements
13. Concrete pavements, thickness design, reinforcements, joints
14. Maintenance and rehabilitation of pavements

Class/laboratory schedule: Two 70-minute lectures per week

Computer Usage: Area and volume of earthwork, Lotus

Design Projects: Open channel through an urban area, street drainage in a city (5 blocks), route location, given the route to calculate earthwork quantities and mass diagram

Laboratory Projects :

1. Field measurements of traffic
2. AC concrete and testing of mixes

Assessment Methods Used:

1. Standard course evaluation

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 3 credit hours or 67%
Engineering Design - 1 credit hour or 33%

Relationship of Course to Program Outcomes:

1.1: i, vi; 1.2: i, ii, iii
2.3: i, ii

Relationship of Course to ABET Criterion 3 (a – k)

a, c, d

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 4114: Aquatic Chemistry
Fall 2004
Elective

2003 - 2006 Catalog Data: **4114: Aquatic Chemistry (Crosslisted with Environmental Science 4114; Slashlisted with 5114).** Prerequisite: Senior standing and one year of general chemistry. Environmental kinetics and thermodynamics in aquatic systems; acid/base, precipitation/solubility, metal complexation, and oxidation/ reduction reactions; environmental colloidal and solid-liquid interface chemistry. No student may earn credit for both 4114 and 5114 or Environmental Science 4114 and 5114. **Laboratory** (F)

Prerequisites: Senior standing and one year of general chemistry.

Textbook(s) and/or other required material:
Jensen, J. N. (2003), *A Problem Solving Approach to Aquatic Chemistry*, Wiley, New York.

Objectives: The objective of this course is to quantify and predict the distribution of aquatic chemical species as a function of environmental conditions such as pH, partial pressures of O_2(g) and CO_2(g), and temperature. The course focus is application of a chemical equilibrium approach to determine chemical speciation. Analytical, graphical, and numerical (i.e., computer) approaches are used for this purpose. Chemical kinetics are also used to determine speciation.

Coordinator: Dr. Elizabeth C. Butler, Associate Professor, School of Civil Engineering & Environmental Science

Prerequisites by Topic:
1. Introductory chemistry
2. Algebra
3. Calculus

Topics:

Week 1	Thermodynamics/chemical equilibria
Weeks 2-3	Aqueous species (acids, bases, salts); acid base equilibria/tableau method
Week 4	Log C-pH diagrams; carbonate system (open and closed)
Weeks 5-7	Alkalinity
Weeks 8-9	Buffer capacity; complexation reactions
Weeks 10-11	Precipitation/dissolution reactions
Weeks 12-14	Oxidation/reduction reactions
Week 15	Chemical kinetics
Week 16	Chemical kinetics; problem solving; mock final exam

Class/laboratory schedule: One 150-minute lecture and one 170-minute laboratory per week

Computer Usage: Spreadsheets for data analysis and graphing, word processing for writing laboratory and project reports, MINEQL+ for solving chemical equilibrium problems.

Design Projects:

- Homework questions and in-class problems requiring calculation of the pH of diluted acidic/basic wastewaters prior to discharge to surface waters.
- MINEQL+ assignment requiring calculation of the polyphosphate dose required to prevent iron oxide precipitation in drinking water distribution pipes.
- MINEQL+ project requiring calculation of the lime dose required for orthophosphate removal from wastewater.

Laboratory Projects (includes both wet laboratories and MINEQL+ workshops):

Week 1	No Laboratory or MINEQL+ Workshop
Week 2	No Laboratory or MINEQL+ Workshop
Week 3	MINEQL+ Workshop 1: Equilibrium constants/activity corrections
Week 4	MINEQL+ Workshop 2: Acid/base equilibria
Week 5	MINEQL+ Workshop 3: Carbonate system/alkalinity
Week 6	Laboratory 1: Carbonate system/alkalinity
Week 7	OU Fall student holiday: no class
Week 8	Laboratory 2: Hardness determination
Week 9	MINEQL+ Workshop 4: Complexation reactions
Week 10	Laboratory 3: Calcium carbonate equilibria
Week 11	OU College of Engineering Open House: no class
Week 12	MINEQL+ Workshop 5: Precipitation/dissolution reactions
Week 13	MINEQL+ Project Workshop
Week 14	Thanksgiving holiday: no class
Week 15	Laboratory 4: Environmental redox reactions
Week 16	No Laboratory or MINEQL Workshop

Assessment Methods Used:

1. Standard course evaluation

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 4 credit hours or 75%
Engineering Design - 1 credit hours or 25%

Relationship of Course to Program Outcomes:

1.1: iv
2.1: iv

Relationship of Course to ABET Criterion 3 (a – k)

a, c, e, j, k

Prepared by: Elizabeth C. Butler **Date**: February 10, 2005

CE 4123 - Open Channel Flow
Spring 2005
Elective

2003-2006 Catalog Data: **4123 Open Channel Flow.** Prerequisite: Engineering 3223. Theory, analysis and design of channels, aqueducts, headworks, siphons, spillways and hydraulic structures. An in-depth study of critical flow and measurement techniques. Backwater analysis by analytical, calculator and computer methods. Special emphasis on practical problems of general interest. (F)

Prerequisites: CE 2223

Textbook(s) and/or other required material:
T. W. Sturm, *Open Channel Hydraulics,* McGraw-Hill, 2001

Course Objectives: Introduce the student to a broad range of topics in open channel hydraulics, including the following: energy, momentum, and continuity equations, uniform flow, gradually-varied flow, rapidly-varied flow, and sediment transport. Class activities will allow the student to gain a qualitative understanding as well as a sound theoretical background. Students must demonstrate, via quizzes, homework assignments, and exams, both a conceptual understanding and familiarity with analysis and design tools. Concepts learned in class will then be applied to practical hydraulic design problems. Upon successful completion of the course, the student should have the tools needed to solve most steady-flow open channel problems, such as analysis and design of natural and man-made channels, computation of water surface profiles, floodplain analysis, and design of hydraulic structures.

Coordinator: Dr. Randall L. Kolar, Associate Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Fluid mechanics
2. Laptop computer

Topics:
1. Introduction to open channel flow
2. Review of fluid mechanics, including the governing conservation equations
3. Uniform flow and its computation
4. The energy principle and critical depth
5. Gradually-varied flow and computation of water surface profiles
6. HEC-RAS
7. The momentum principle, rapidly-varied flow, and channel controls

8. Sediment transport
9. Hydraulic structures and transient flow

Class/laboratory schedule: Two 75-minute lectures per week

Computer Usage: Extensive computer usage throughout course using PC-based software for channel analysis & design (e.g., Haestad Methods FlowMaster) and water surface profiles (HEC-RAS). Also, graphic and word processing software required for project report.

Design Projects: Floodplain analysis and bridge design for Sooner River.

Laboratory Projects: None

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Math and /Basic Sciences – 0 credit hours or 0%
Engineering Science - 2 credit hours or 67%
Engineering Design - 1 credit hour or 33%

Program Objectives and Related Strategy and Actions:
1.1: iv
2.1: iv

Criterion 3 Contents:
a, c, e, j, k

Prepared by: K.A. Strevett **Date**: May 14, 2005

CE 4234 - Applied Environmental Microbiology
Fall 2004
Elective

2003-2006 Catalog Data: **4234 Applied Environmental Microbiology (Slashlisted with 5234).** Prerequisite: 3234, Engineering 2213 and 3223. Basic environmental microbiology and bioenvironmental engineering. Presentation of the diversity and importance organisms involved in solid and liquid waste reduction. The course examines basic microbiology, biodegradation mechanisms, bioavailability, biotreatability studies, groundwater remediation (both oxic and anoxic), and bioengineering process technologies. No student may earn credit for both 4234 and 5234. **Laboratory** (F)

Prerequisites: CE 3243: Water and Wastewater Treatment

Textbook(s) and/or other required material:
1. Chapelle, F.H., Groundwater Microbiology and Geochemistry, Wiley, NY, 1993
2. Alexander, M., Biodegradation and Bioremediation, Academic Press, NY, 1994
3. Laboratory: Pepper, I.L., Gerba, C.P., and Brendecke, J.W., Environmental Microbiology, Academic Press, New York, 1997

Course Objectives: This course will provide introduction to biotic systems important to environmental remediation. The course emphasizes microbial ecology, microbial physiology, and bacterial metabolism.

Coordinator: Dr. Keith A. Strevett, Associate Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Understanding of basic calculus.
2. Understanding of basic analysis and parameters studied in CE 3234 mass balance and fate processes

Topics:
1. Introduction to AEM
2. Groundwater Microbiology
3. Biogeochemistry
4. Microbial Nutrition
5. Reaction Kinetics
6. Biokinetics
7. Bioenergetics
8. Introduction to Bioremediation
9. Central Metabolism
10. Petroleum HC Metabolism
11. Halogenated HC Metabolism

12. Bioavailability
13. Technologies

Class/laboratory schedule: Three 50-minute lectures plus one 4-hour laboratory per week

Computer Usage: Three homework assignments germane to kinetics and site expressions require students to develop spreadsheets. The project requires the students to use Mathcad and a modeling program from USEPA (Bioplume).

Design Projects: Students work in groups of four and determine Best Technology Approach to open-ended, real-life site. 1998 site was Dover AFB and site contaminants were TCE, DCE, and PCE.

Laboratory Projects:
1. Laboratory Safety; Introduction to GC, LC
2. Sterile Technique and Microscope Introduction
3. Sulfur and Nitrogen
4. Chemical/Biological Oxygen Demand
5. Culture Media/Nutrients
6. Microbial Sampling – Surface Water
7. Algae and Photosynthesis
8. Isolation – Soil Bacteria
9. Microbial Sampling – Groundwater
10. Isolation – Landfill Leachate
11. Coliform/Total Bacteria, Actinomycetes
12. Assimilable Organic Carbon
13. Phenol Degradation
14. BTEX Degradation

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Math and Basic Science – 0 credit hours or 0%
Engineering Science - 3 credit hours or 100%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:
1.1: iv
2.1: iv

Relationship of Course to ABET Criterion 3 (a – k)
a, c, e, j, k

Prepared by: Keith A. Strevett **Date:** May 15, 2005

CE 4663 – Introduction to Matrix Method
Fall 2004
Elective

2003-2006 Catalog Data: **G4663 Introduction to Matrix Method.** Prerequisite: 3414. Review of matrix algebra and solution of linear equations; energy concepts and principle of virtual work; fundamentals of flexibility and stiffness methods; coordinate transformation and matrix assemblage; computer-oriented direct stiffness method and computer code developments; secondary effects; support settlement and temperature change; method of finite differences and application to beam and plate problems. **Laboratory** (F)

Prerequisites: CE 3414

Textbook(s) and/or other required material:
None

Course Objectives: Students will gain a fundamental understanding of matrix methods in structural analysis.

Coordinator: Dr. Bui Dao, Instructor, School of Civil Engineering and Environmental Science

Topics:
1. Introduction
2. Review mechanics of solids
3. Classical structural analysis methods
4. Deflected shapes
5. Matrix notation
6. Cal 91 Program
7. Material properties
8. Virtual work principle
9. Matrix structural analysis for truss
10. Matrix structural analysis for beam
11. Matrix structural analysis for frame
12. Direct stiffness method
13. Matrix method in structural analysis using Cal 91
14. Two dimensional element
15. Analysis procedures – check results
16. Analysis of building using E-TAB
17. Analysis of general structures using ANSYS
18. Geometric stiffness

Class/laboratory schedule: One 170-minute lecture per week

Computer Usage: Cal 91, E-TAB, ANSYS

Design Projects: Analysis of a three dimensional structural building and structural analysis of an off shore drilling rig.

Laboratory Projects: Laboratory was used for computer program demonstration.

Assessment Methods Used:

6. Standard course evaluation

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 1 credit hours or 33%
Engineering Design – 2 credit hours or 67%

Relationship of Course to Program Outcomes

1.1: iv
2.1: iv

Relationship of Course to ABET Criterion 3 (a – k):

a, c, e, j, k

Prepared by: Keith Strevett **Date**: June 14, 2005

CE 4803 – Civil Engineering Professional Practice
Fall 2004
Required

2003-2006 Catalog Data: **4803 Civil Engineering Professional Practice.** Prerequisites: 3213, 3253, 3364 and 3414. Nature of profession, duties and administrative responsibilities, organization and management of operating divisions with emphasis on role of civil engineering professional. Functional approach to planning and implementing public works needs with emphasis on role of civil engineering professional. (F)

Prerequisites: CE 3213, CE 3253, CE 3364, CE 3414

Textbook(s) and/or other required material:
None

Course Objectives: This course introduces students to technical and non-traditional issues related to professional practice. Emphases are placed on the nature of professional practice related to organization, management and planning of civil/environmental engineering projects.

Coordinator: Dr. Robert C. Knox, John A. Myers Professor and Director, School of Civil Engineering and Environmental Science

Topics:
1. Team Building (2 weeks): Personality Tests; Resumes Development; Team Assignments; Lego Communications
2. Project Management (2 weeks): Organizational Management; Project Documents; Decision-making
3. Economics (2 weeks): Engineering Economics; Time Value of Money; Cost estimating
4. Ethics (2 weeks): Professional Societies; Code of Ethics; Professional registration; Rules of Conduct for PE's
5. Professional Communications (3 weeks): Data Reduction and Presentation; Oral Presentations; Written Communication Skills
6. Design Codes (2 weeks): Guest Lecture
7. Introduction of Capstone Project (2 weeks)

Class/laboratory Schedule: One 170-minute lecture per week

Computer Usage:
1. Extensive use of word processing and spreadsheets in developing reports
2. Specialized programs for completing various aspects of project, e.g., AUTOCAD, and developing presentations, e.g., PowerPoint, Harvard Graphics, etc.

Design Projects: Student teams will be given a general problem statement and a list of minimum deliverables for the ensuing spring capstone project. The teams will be responsible for developing a detailed scope of work for the spring project. The scope of work will include a management structure, a detailed list of project deliverables and a proposed schedule for completing work tasks associated with each major aspect of the project. Each team will also deliver an oral presentation regarding their proposed scope of work. The oral presentations can include select members of the team but must use available multimedia technology and should be well-rehearsed. All team members should be in attendance at the final oral presentations.

Laboratory Projects: None

Written and/or Oral Communications:
1. Each student is required to develop a professional resume and to develop assigned sections of the written technical document.
2. Each student is expected to contribute equitably to group exercises and homework assignments.
3. Each student is expected to contribute equitably to group oral presentations.

Teamwork: All work will be conducted in a professional atmosphere similar to that found in any consulting engineering design firm. Students will be organized into design teams and led by a project manager. Project managers will be chosen by personnel from the Capstone Advisory Board based upon resumes submitted by the students.

Assessment Methods Used:
1. Standard course evaluation with supplemental questions
2. Peer/self evaluations
3. Practitioner evaluation of ethics interpretations, major design effort, written report and oral presentation
4. Reflective writing

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 0 credit hours or 0%
Engineering Design - 3 credit hours or 100%

Relationship of Course to Program Outcomes
1.2: i, ii, iii, iv; 1.3: ii, iii
2.1: ii, iii, v; 2.2: ii, iii, vi; 2.3: i, ii, iii

Relationship of Course to ABET Criterion 3 (a – k):
c, d, f, g, h, i, j

Prepared by: Robert C. Knox **Date:** May 15, 2005

CE 4903 - Civil Engineering Design
Spring 2005
Required

2003-2006 Catalog Data: **4903: Civil Engineering Design.** Prerequisite: 4803, senior standing in Civil Engineering curriculum. Solution of major design problems by a team approach requiring the synthesis of several disciplines and adaptation as a civil engineering system; problems to be varied within the several areas of civil engineering according to the student's major interest. The design project will be under direct staff supervision. (Sp)

Prerequisite: CE 4803

Textbook(s) and/or other required material:
None

Course Objectives: The capstone design experience is a course in which students draw upon various aspects of their undergraduate coursework to develop a comprehensive, engineered solution to an open-ended problem. The design problem is addressed by multidisciplinary student design teams. The semester project addresses a real-world problem and is coordinated with practicing engineers. Faculty coordinators serve in an advisory capacity and coordinate class meetings and presentations. Because of the required prerequisites, students are presumed to have been adequately trained in the fundamental principles of engineering analysis and have been introduced to the concepts of engineering design; class presentations are on non-traditional topics.

Coordinator: Dr. Kim Mish, Presidential Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic: Completion of, or concurrent enrollment in, all professional electives and required engineering courses up through the first semester of the senior year.

Topics:
Week 1. Course overview, personality testing, resumes – HW1 professional resume
Week 2. Project scope and description
Week 3. Team building, motivation and leadership
Week 4. Technical writing/oral presentations
Week 5. Organizational management - HW2 team organizational structure
Week 6. Project alternatives/The Charette Format
Week 7. Preliminary Design (35%) Submittal - peer evaluations
Week 8. 35% completion review

Week 9. Team working session
Week 10. Ethics Scenarios – HW3 ethics interpretation
Week 11. Preliminary Design (65%) Submittal - peer evaluations
Week 12. 65% completion review
Week 13. Team working session
Week 14. 100% design submittal, design presentation (practice) - peer evaluations
Week 15. Final presentations

Class/laboratory schedule: Two 170 minute class meetings per week
Computer Usage:

1. Extensive use of word processing and spreadsheets in developing reports
2. Specialized programs for completing various aspects of project, e.g., AUTOCAD, and developing presentations, e.g., PowerPoint, Harvard Graphics, etc.

Design Projects: The focus of the comprehensive design project varies from year to year.

Laboratory Projects: Project specific

Written and/or Oral Communications:

4. Each student is required to develop a professional resume and to develop assigned sections of the written technical document.
5. Each student is expected to contribute equitably to group exercises and homework assignments.
6. Each student is expected to contribute equitably to group oral presentations.

Teamwork: All work will be conducted in a professional atmosphere similar to that found in any consulting engineering design firm. Students will be organized into design teams and led by a project manager. Project managers will be chosen by personnel from the Capstone Advisory Board based upon resumes submitted by the students.

Assessment Methods Used:

1. Standard course evaluation with supplemental questions
2. Peer/self evaluations
5. Practitioner evaluation of major design effort, written report and oral presentation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 0 credit hours or 0%
Engineering Design – 3 credit hours or 100%

Relationship of Course to Program Outcomes
1.1: vi; 1.2: i, ii, iii, iv; 1.3: iii
2.1: ii, iii, v; 2.3: i, ii

Relationship of Course to ABET Criterion 3 (a – k):

a, b, c, d, e, f, g, h, i, j

Prepared by: Robert C. Knox **Date:** May 15, 2005

CE 5020 – Bridge Engineering Fundamentals
Spring 2005
Elective

2003-2006 Catalog Data: New course, not in current catalog.

Prerequisites: A thorough understanding of Structural Analysis and at least one CE structural design course (CE3663 or CE3673)

Textbook(s) and/or other required material:
None

Course Objectives: Gain an understanding of the major elements of bridge engineering practice, e.g., design, analysis, and management of bridges.

Coordinator: Dr. Kyran D. Mish, Professor, School of Civil Engineering and Environmental Science

Topics:

1. Introduction to bridge engineering practice
2. Bridge design
3. Bridge construction
4. Structural bridge analysis
5. Bridge foundation design
6. History of bridge design

Class/laboratory schedule: Two 75-minute lectures per week.

Computer Usage: None

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:

7. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 2 credit hours or 67%
Engineering Design – 1 credit hour or 33%

Relationship of Course to Program Outcomes

1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Keith A. Strevett **Date**: June 14, 2005

CE 5021 - Technical Communications
Spring 2005
Elective

2003-2006 Catalog Data: **G5021: Technical Communications (Crosslisted with Environmental Science 5021).** Prerequisite: CEES graduate standing or permission of instructor. Focused on enabling students to improve oral and written communications skills. Examines appropriate formats for various technical publications, as well as methods and practices for developing effective oral presentations. Each student will be required to develop an oral presentation about his/her written product. (F)

Prerequisites: The course is open to all CoE students who can identify a faculty member willing to work with them on the semester project. The course is mandatory for all CEES graduate students at the appropriate point in the degree plan.

Textbook(s) and/or other required material:
Alley, M., The Craft of Scientific Writing, Third Edition. 1996, Springer-Verlag, New York.

Course Objectives: This course is focused on enabling students to improve their oral and written communications skills. The course will examine the appropriate formats (structure, style, referencing) for various technical publications, including detailed discussions of the content of the specific sections of a technical publication. Discussions will also focus on proper word usage and sentence structures for technical documents. The course will also examine methods and practices for developing effective oral presentations, including the use of visual aids and multimedia technology. Each student will identify a "written communications project" for the semester (i.e., special topics, thesis or dissertation prospectus). The course will have intermediate milestones (e.g., outlines, first draft, revised drafts) designed to track progress toward achieving the goal. Each student will also be responsible for developing an oral presentation about his/her written product.

Coordinator: Dr. Robert C. Knox, John A. Myers Professor and Director, School of Civil Engineering and Environmental Science

Topics:
Week 1: Student orientation and discussion of course
Week 2: Outlines
Week 3: Prospectus Outline; Dealing With Data; Compilation of data
Illustration of data
Week 4: Analysis and interpretation of data
Week 5: Language - Choosing the right word; Choosing the right level of detail; Avoiding needless complexity; Avoiding ambiguity; Technical Writing

Week 6: Language - Controlling tone; Strong nouns and verbs; Avoid unfamiliar terms: Incorporating examples and analogies
Week 7: Language -Eliminating redundancies; Reducing sentences to simplest form; Eliminating discontinuities; Effective Visual Aids
Week 8: Effective oral presentations
Week 9-14: Oral presentations

Class/laboratory schedule: One 70-minute lecture per week.

Computer Usage:
1. Extensive use of word processing and spreadsheets in developing reports
2. Specialized programs for completing various aspects of project, e.g., AUTOCAD, and developing presentations, e.g., PowerPoint, Harvard Graphics, etc.

Design Projects:
Each student must identify a CEES faculty member to work with on their "written communications project." The professor will read the final product and provide an evaluation of "satisfactory" or "unsatisfactory".

Laboratory Projects: None

Written and/or Oral Communications:
Each student is responsible for developing an oral presentation regarding his/her written project. The oral presentations must utilize available multimedia technology. The oral presentations will be made before the class and CEES faculty. The oral presentations will be evaluated by the CEES faculty in attendance

Assessment Methods Used:
8. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
g

Prepared by: Robert C. Knox **Date:** May 15, 2005

CE 5333 - Foundation Engineering
Spring 2005
Elective

2003-2006 Catalog Data: **G5333: Foundation Engineering.** Prerequisite: 3363, 3673. Advanced substructure analysis and design to meet various soil conditions; footings and rafts, shoring and underpinning, piles, cofferdams, caissons, breakwaters, piers, wharves, vibratory effects on foundations. (Sp):

Prerequisites: CE 3364, CE 3673
(Note, CE3363 course number changed to 3364)

Textbook(s) and/or other required material:
Das, B.M. (2004). Principles of Foundation Engineering, 5th Edition. Brooks/Cole, CA.

Course Objectives: This course will provide methodologies and analysis procedures to design foundations, with an emphasis on the geotechnical aspects of design.

Coordinator: Dr. Amy B. Cerato, Assistant Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic: Soil Mechanics
Structural Design – Steel I

Topics:
1. Introduction to Foundations, Review Soil Mechanics
2. Introduction to In Situ Testing
3. Subsurface Exploration and Soil Profiles for Foundation Design
4. Shallow Foundation Analysis and Design
5. Deep Foundation Analysis and Design
6. Earth Retaining Structure Analysis and Design

Class/laboratory schedule: Three 50-minute lectures per week

Computer Usage: Excel spreadsheets/graphing programs and word processing used on various homework assignments and design reports.

Design Projects: Students will complete three design projects. The first two projects use in situ test data and boring log information to design shallow foundations and the third report uses boring logs and in situ test data in the design of deep foundation. Final reports are submitted in the form of a Geotechnical Report.

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 0 credit hours or 0%
Engineering Design – 3 credit hours or 100%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Amy B. Cerato **Date:** March 27, 2005

CE 5343 - Advanced Soil Mechanics
Fall 2004
Elective

2003 - 2006 Catalog Data: **G5343: Advanced Soil Mechanics.** Prerequisite: 3363, Mathematics 3113. Advanced treatment of theories and principles of shearing strength, stress distribution and settlement analysis. (F)

Prerequisites: CE 3363, MATH 3113

Textbook and/or other required material:
None

Course Objectives: To provide students with an understanding of advanced theories of soil mechanics and their applications in geotechnical engineering.

Coordinator: Dr. Gerald A. Miller, Ph.D., P.E., Associate Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Soil mechanics
2. Differential equations

Topics:
1. Introduction
2. The Nature of Soil Constituents
3. Stresses in a Soil Mass
4. Stress-Strain Behavior of Soils
5. Drained and Undrained Soil Behavior
6. Steady-State and Transient Flow of Water Through Soil
7. Consolidation in Saturated Soils
8. Compressibility and Settlement
9. Shear Strength and Stability
10. Unsaturated Soil Mechanics
11. Constitutive Modeling

Class/laboratory schedule: Two 75-minute classes per week

Computer Usage: Excel spreadsheet used on various homework assignments.

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:

9. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 2 credit hours or 67%
Engineering Design – 1 credit hours or 33%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Keith A. Strevett **Date**: June 14, 2005

CE 5353 – Introduction to Soil Dynamics
Fall 2002
Elective

2003 - 2006 Catalog Data: **G5353 Introduction to Soil Dynamics.** Prerequisite: 3363 or permission of instructor. Review of basic concepts (single- and multi-degree of freedom system, wave propagation, behavior of dynamically loaded soils), liquefaction, vibrations of footings on elastic half space, analog models, dynamics of pile foundations, machine foundations, design of foundations for dynamic loads including earthquake loading. (Irreg.)

Prerequisites: CE 3364 or permission of instructor
(Note: CE 3363 was replaced by course number CE 3364)

Textbook(s) and/or other required material:
None

Course Objectives: Develop an understanding of the dynamic behavior of soils and design soil structures for dynamic loads.

Coordinator: Dr. K.K. Muraleetharan, Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Soil mechanics

Topics:
1. Introduction.
2. Vibration of a single degree of freedom system.
3. Wave propagation through soils.
4. Liquefaction of soils: Evaluation of liquefaction potential, surface manifestations, liquefaction mitigation, and pore pressure response of level ground sites.
5. Dynamic settlement of level ground sites.
6. Dynamic deformation of slopes.
7. Advanced concepts: Introduction to centrifuge testing, introduction to fully-coupled analysis procedures, and dynamic behavior of unsaturated soils.
8. Dynamic earth pressures on retaining walls (*if time permits*).
9. Machine foundation (*if time permits*).

Class/laboratory schedule: Two 75-minute lectures per week

Computer Usage: SHAKE

Design Projects: Site response and liquefaction analysis of a level ground site

Laboratory Projects: None

Assessment Methods Used:
10. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 1 credit hours or 33%
Engineering Design – 2 credit hours or 67%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, d, e, j, k

Prepared by: K.K. Muraleetharan **Date**: June 14, 2005

CE 5404 – Soil Stabilization
Fall 2004
Elective

2003 - 2006 Catalog Data: **G5404: Soil Stabilization.** Prerequisite: 3403, 3363. Principles and methods of soil stabilization; soil-aggregate, soil-chemical stabilization; grouting; design and laboratory testing of stabilized soils. **Laboratory.** (Irreg.)

Prerequisites: CE 3403, CE 3364

Textbook(s) and/or other required material:
None

Reference: None

Course Objectives: To introduce fundamental concepts of improving and upgrading soil conditions by applying previously learned geotechnical principles and testing methods.

Coordinator: Dr. Joakim G. Laguros, Ph.D., P.E., David Ross Boyd Professor Emeritus, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Materials
2. Soil mechanics

Topics:
12. Overview
13. Clay mineralogy
14. Soil structure
15. Preloading, sand drains
16. Compaction
17. Stabilization
18. Ashes
19. Portland Cement and CKD
20. Bituminous & polymer
21. Electroosmosis & thermal
22. Grouting and waste products

Class/laboratory schedule: One 75-minute lecture per week and two 110 minute laboratories per week.

Computer Usage: None

Design Projects: None

Laboratory Projects: Stabilization of two soils with class C fly ash and cement kiln dust.

Assessment Methods Used:
11. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 2 credit hours or 67%
Engineering Design – 1 credit hours or 33%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Keith A. Strevett **Date**: June 14, 2005

CE 5413 – Soil-Structure Interaction
Fall 2004
Professional Elective

2003 - 2006 Catalog Data: **G5413: Soil-Structure Interaction.** Prerequisite: 3363 or permission of instructor. Introduction-definition, methods of solution; beams on deformable foundations; analysis and design of axially loaded structures – single pile, pile groups, retaining walls; plates on deformable foundations; role of interfaces and joints; wave equation for pile behavior. (Irreg.)

Prerequisites: CE 3364 or permission of instructor
(Note, CE 3363 was replaced by course number CE 3364))

Textbook(s) and/or other required material:
None

Reference: None

Course Objectives: This course introduces the students to the important topics in soil-structure interaction. The course is devoted primarily to derivations, applications, and limitations of available methods, such as finite difference, finite element, energy, and closed-form solutions, for analysis and design of foundations. Both shallow foundations (namely beams and plates) and deep foundations (namely single pile and pile groups) will be covered. Also, other topics such as the structure-foundation-soil interaction problems associated with cylindrical storage tanks will be discussed.

Coordinator: Dr. M.M. Zaman, David Ross Boyd Professor, Aaron Alexander Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Soil mechanics

Topics:
23. Introduction
24. Beams on elastic foundation
25. Axially loaded structures (single pile)
26. Pile groups
27. Square and rectangular plates on elastic foundation
28. Circular plates on elastic foundation
29. Structure-foundation-Soil interaction
30. Nonlinearity in soil-structure interaction problems
31. Recent advances

Class/laboratory schedule: Two 75-minute lectures per week

Computer Usage: Excel spreadsheet for homework

Design Projects: Pile group analysis

Laboratory Projects: None

Assessment Methods Used:
12. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 1 credit hours or 33%
Engineering Design – 2 credit hours or 67%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Keith A. Strevett **Date**: June 14, 2005

CE 5423 - Environmental Geotechnology
Spring 2005
Elective

2003-2006 Catalog Data: **5423 Environmental Geotechnology**. Prerequisite 3234 and 3363, or permission of instructor. Covers geotechnical issues in environmental problems and solutions. Site characterization; laboratory and in situ testing for environmental applications; soil mineralogy and fabric; design and construction of contaminant barriers and landfill liners. (Sp)

Prerequisites: CE 3243, 3364
(Note: CE 3363 was replaced by course number CE 3364)

Textbook(s) and other required material:
None

Coordinator: Dr. K.K. Muraleetharan, Professor, School of Civil Engineering and Environmental Science

Course Objectives: Geotechnical engineering is an integral part of solving environmental problems. This course will attempt to provide a broad understanding of geotechnical issues in environmental problems and solutions.

Prerequisites by Topic:
1. Soil mechanics
2. Basic understanding of ground water quality management

Topics:
1. Introduction
2. Basic definitions and phase relationships for soils
3. Site characterization- Health and safety plan (general); Geophysical methods; Cone Penetration Tests; Drilling and soil sampling; Monitoring well installation, well development and water sampling; Hydropunch™ water sampling; BAT™ testing; Double ring infiltrometer permeability testing
4. Laboratory testing- Behavior of unsaturated soils; Permeability testing on saturated and unsaturated soils; Geosynthetic testing including interface properties
5. Soil Composition and fabric and their influence on soil behavior- Clay mineralogy; Pore fluid chemistry; Soil particle surface - pore fluid interaction; Arrangement of soil particles; Compaction; Conduction phenomena; Retention of pollutants
6. Design and Construction of Landfill covers and bottom liners- Regulations; Static and seismic design; Construction aspects and QA/QC
7. Design and construction of slurry walls
8. Physical and numerical modeling of pollution transport processes- Physics of the problem; Available computer codes; Bench tests vs. Centrifuge model tests

Class/laboratory schedule: Two 75-minute lectures per week

Computer Usage: Spreadsheet

Design Projects: Students analyze field and laboratory data from a Phase II environmental assessment at various sites of concern along a subway tunnel segment and write a report summarizing the findings. The report includes environmental concerns, investigation and findings, extent of contamination, and recommendations.

Laboratory Projects: Demonstration of unsaturated soil testing equipment

Assessment Methods Used:

1. Standard course evaluation

Contribution to Professional Component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 2.0 credit hours or 67%
Engineering Design - 1.0 credit hours or 33%

Relationship of Course to Program Outcomes:

1.1: iv

Relationship of Course to ABET Criterion 3 (a – k)

a, c, e, j, k

Prepared by: K. K. Muraleetharan **Date**: February 14, 2005

CE 5653 - Advanced Mechanics of Materials
Fall 2003
Elective

2003-2006 Catalog Data: **G5653 - Advanced Mechanics of Materials.** Prerequisite: Engineering 2153 and senior or graduate standing. Principal stresses and strains; theories of failure; introduction to elasticity; unsymmetrical bending and shear; torsion of noncircular solid cross-sections, cellular sections and open sections; introduction to plate bending and buckling. (F)

Prerequisites: CE 2153

Textbook(s) and/or other required material:
Elastic and Inelastic Stress Analysis, Shames and Cozzarelli, Revised Printing, Taylor & Francis, 1997 (ISBN 1-56032-686-7)

Course Objectives: Further develop the concepts learned in the undergraduate mechanics course. Establish a systematic overview on linear elasticity, plasticity, viscoelastic and viscoplasticity by relating theories to wide range applications in structural engineering and engineering mechanics. Develop an ability to analyze complex state of stress and strain in structural components by using the established closed formed solutions. Form a foundation for students to further pursue advanced courses such as continuum mechanism and fracture mechanics.

Coordinator: Dr. Jin-Song Pei., Assistant Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Statics/equilibrium principles
2. Elementary strength of materials
3. Ordinary differential equations

Topics:
1. Theory of Linear Elasticity
2. Applications of Linear Elasticity
3. Time Dependent Inelastic Materials
4. Introduction to Thermal Stresses
5. Introduction to Time Independent Inelastic Materials

Computer Usage: Students use spreadsheets and Matlab to do some homework problems

Class/laboratory schedule: One 150-minute lecture period

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
13. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 1 credit hours or 33%
Engineering Design – 2 credit hours or 67%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Jin-Song Pei **Date**: June 14, 2005

CE 5673 – Dynamics of Structures
Spring 2004
Elective

2003-2006 Catalog Data: **G5673 – Dynamics of Structures** Prerequisite: 3253, 4673. Free vibration, forced vibration and transient response of structures having one, multiple or infinite number of degrees-of-freedom; structural damping effects; numerical solution techniques; Lagrange's equation of motion; Rayleigh-Ritz method. General matrix formulation for multiple degrees-of-freedom, modal coordinate transformation. Introduction to earthquake engineering concepts. (F)

Prerequisites: CE 3253 and CE 3414
(Note, the Course Catalog has a typographical error)

Textbook(s) and/or other required material:
*Dynamics of Structures***,** Anil K. Chopra, 2nd Edition, Prentice Hall, 2002

References: None

Course Objectives: Further develop the concepts learned in the undergraduate mechanics course. Establish a systematic overview on linear elasticity, plasticity, viscoelastic and viscoplasticity by relating theories to wide range applications in structural engineering and engineering mechanics. Develop an ability to analyze complex state of stress and strain in structural components by using the established closed formed solutions. Form a foundation for students to further pursue advanced courses such as continuum mechanism and fracture mechanics.

Coordinator: Dr. Jin-Song Pei., Assistant Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Continuum Mechanics
2. Ordinary differential equations and linear algebra
3. Structural analysis

Class/laboratory schedule: One 150-minute lecture period

Topics:
1. Single-Degree-of-Freedom Systems (4 weeks)
2. Earthquake Nature and Earthquake Response of Linear Systems (2 weeks)
3. Generalized Single-Degree-of-Freedom Systems (1weeks)
4. Multi-Degree-of-Freedom Systems (3 weeks)
5. Distributed Parameter Systems (2 weeks)

6. Earthquake Response of Inelastic systems (1 week)
7. Structural Dynamics in Earthquake Building Codes (1 week)

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
14. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 1 credit hours or 33%
Engineering Design – 2 credit hours or 67%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Keith A. Strevett **Date**: June 14, 2005

CE 5753 – Structural Design - Wood
Spring 2005
Required

2003-2006 Catalog Data: **G5753: Structural Design - Wood.** Prerequisite: 3663 or 3673 or equivalent. Material properties and behavior of wood. Analysis and design of solids and laminated structural members, connections, systems, trusses, and arches. Current developments in structural wood design and research. (Sp)

Prerequisite: CE 3663 or 3673

Textbook(s) and/or other required material:
Breyer, Fridley, Pollock and Cobeen "Design of Wood Structures"

Course Objectives: The student will gain a coherent understanding of design principles for a variety of timber members and systems and earn general applications of International Building Code principles for structures in general and timber systems in particular.

Coordinator: Dr. Kim Mish, Presidential Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic: Completion of, or concurrent enrollment in Concrete I or Steel I

Topics:

1. Timber members
   Beams
   Columns
   Diaphragms
2. International Building Code

Class/laboratory schedule: Two 75-minute periods per week.

Computer Usage: None

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
15. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 1 credit hours or 33%
Engineering Design – 2 credit hours or 67%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Keith A. Strevett **Date**: June 14, 2005

CE 5763 – Introduction to Finite Element Method
Spring 2005
Elective

2003 - 2006 Catalog Data: **G5763 Introduction To Finite Element Method (Crosslisted with Aerospace and Mechanical Engineering 5763).** Prerequisite: 5663. Weighted residual and variational approaches. Finite element formulation for rod, truss and beam elements; plane stress and plane strain problem; axi-symmetric and three-dimensional analysis; isoparametric elements; conforming and nonconforming plate and shell elements. **Laboratory** (Sp)

Prerequisites: No prerequisites within Civil Engineering.

Textbook(s) and/or other required material:
None

Course Objectives: Introduce students to fundamentals and computer applications of the finite element method

Coordinator: Dr. K.K. Muraleetharan, Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic: Linear Algebra

Topics:

1. Heat conduction (example problem) and its relation to other field problems such as torsion, seepage and fluid flow: Derivation of governing differential equations.
2. Basic concepts of approximate analyses: Ritz procedure, collocation, least square, weighted residual and Galerkin's method
3. Finite element analysis of 1-D heat conduction: Element and system matrices, application of boundary conditions, solution procedures, and convergence and accuracy
4. 2-D Finite element analysis: Simple triangular elements, higher order triangular elements, isoparametric elements, and higher order isoparametric elements
5. Special Problems: Structural problems (displacement based FEM, beam elements, plate elements, etc.), fluid flow through porous media, reduced integration, near incompressibility conditions, non-linear problems, and time-dependent problems

Class/laboratory schedule: Two 75-minute lectures per week.

Computer Usage: ANSYS and TeraScale

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
16. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 2 credit hours or 67%
Engineering Design – 1 credit hours or 33%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: K.K. Muraleetharan **Date**: June 14, 2005

CE 5773 - Structural Design–Steel II
Spring 2005
Elective

2003-2006 Catalog Data: **G5773: Structural Design–Steel II.** Prerequisite: 3663. Advanced structural steel design including steel deck diaphragms, column and beam bracing, composite beam design, rigid frame design, torsional member design, plate girder design, and design of building connections. (Sp)

Prerequisites: CE 3663

Textbook(s) and/or other required material:

3. C. G. Salmon & J.E. Johnson, *Steel Structures, Design & Behavior (4th Ed.)*
4. AISC, *LRFD Manual of Steel Construction (3rd Ed.)*

Course Objectives: Students will be able to analyze and design complex structures of steel.

Coordinator: Mr. Chris Ramseyer, Instructor/Graduate Student, School of Civil Engineering and Environmental Science

Prerequisites by Topic:

1. Knowledge of concrete and steel material properties
2. Knowledge of structural analysis

Topics:

7. Material properties and specifications, design philosophies
8. Beams, flexural behavior and design
9. Shear
10. Columns
11. Serviceability
12. Development of reinforcement

Class/laboratory schedule: Two 75-minute periods per week

Computer Usage: None

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:

17. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 1 credit hours or 33%
Engineering Design – 2 credit hours or 67%

Relationship of Course to Program Outcomes
1.1:iv
2.1:iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Keith A. Strevett **Date**: June 14, 2005

CE 5843 - Hydrology
Spring 2005
Elective

2003-2006 Catalog Data: **5843 Hydrology.** Prerequisite: graduate standing in civil engineering, environmental science or geology, or permission. An applied course on hydrology dealing with environmental water problems; principles of hydrologic systems, their structure and components; methods of analysis and their application to various purposes of water resources planning and development. (Sp)

Prerequisite: Graduate standing or permission

Textbook(s) and/or other required material:
Hydrology and Floodplain Management, Third Edition, Bedient and Huber, Prentice Hall.

Course Objectives: Hydrology is the science of water on or near the surface of the earth. Engineering hydrology deals with hydrologic analysis and prediction with the aim of achieving a useful result. Examples are sizing a reservoir to provide adequate water supply with acceptable risk, designing drainage infrastructure for a given frequency of exceedance, or prediction of short or long term response of a watershed. Modeling hydrologic processes has historically been done by lumped methods. Computational and data constraints have limited the development and acceptance of distributed parameter modeling until recent times. The advent of computer aided mapping software called geographic information systems (GIS) and new data sources has prompted the development of models capable of using the information content found in digital datasets. The modules comprising this course are designed to:

1. Acquaint the student with basic principles of hydrology
2. Convey an understanding of hydrologic analysis, prediction, and design
3. Develop an understanding of hydrologic modeling and its use

Coordinator: Dr. Baxter E. Vieux, Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Differential equations
2. Computer Skills in Excel and application modeling

Topics:
1. Hydrologic principles
    a. Precipitation

    b. Hydrologic abstractions and their importance
    c. Surface runoff
    d. Subsurface runoff (base flow)
2. Methods of analysis
    a. Storm analysis and design storms
    b. Quantitative treatment of Hydrologic Abstractions
    c. Hydrologic routing
    d. Distributed hydrologic modeling
    e. Synthetic Hydrograph and their development

Class/laboratory schedule: Three 50-minute lectures per week.

Computer Usage:
1. Students utilize Blackboard Online to access lecture notes, sample data, references, and course materials.
2. Spreadsheets and application software are required for use in homework preparation and term project.

Design Projects: None

Laboratory Projects: Term project
Kinematic wave routing is explored for river reach.
Students must select various parameters governing the hydraulics and assess the impact on hydrologic response, analyze and interpret.

Assessment Methods Used:
1. Standard course evaluation.

Contribution to Professional Component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science - 2.5 credit hours or 83%
Engineering Design - 0.5credit hour or 17%

Relationship of Course to Program Outcomes:
1.1: iv
2.1: iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Baxter E. Vieux **Date:** February 11, 2005

CE/GEOL 5853 – Groundwater and Seepage
Fall 2004
Elective

2003-2006 Catalog Data: **G5853 Groundwater and Seepage (Crosslisted with Geology 5853).** Prerequisite: graduate standing in civil engineering, environmental science or geology or permission. An applied course dealing with properties of aquifers, modeling of groundwater flow, groundwater hydrology and its interrelation with surface water, well hydraulics, pumping tests and safe yield of aquifers. (F)

Prerequisites: Graduate standing or permission of instructor

Textbook(s) or other required material:
C. W. Fetter. *Applied Hydrogeology*, 4th Ed., Prentice Hall: New Jersey, 2001

Course Objectives: To provide students with an understanding of the factors underlying subsurface flow, as well as a practical understanding of groundwater modeling techniques.

Coordinator: Dr. Tohren C. G. Kibbey, Associate Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic: None

Topics:
1. Introduction, Hydrologic Cycle, Aquifer Types and Materials, Fluid Statics Review (1 cl.)
2. Fluid Flow, Darcy's Law, Hydraulic Conductivity, Intrinsic Permeability (1cl.)
3. 1D groundwater flow equations: confined and unconfined, multiple dimensions/anisotropy, 2D and 3D groundwater flow equations (1cl.)
4. Radial flow: confined and unconfined, Thiem equation, Theis equation, Jacob-Cooper equation, superposition, image wells (1cl.)
5. Well tests: Thiem, Theis, Jacob, slug tests, special cases (1 cl.)
6. Numerical solution of groundwater flow equations (0.5 cl.)
7. Contaminant transport overview (0.5 cl)
8. Well placement strategies for remediation (0.5 cl)
9. Unsaturated flow: Surface tension/contact angle, Capillary pressure/saturation relationships (1 cl.)
10. Hysteresis in capillary pressure/saturation relationships, Parameterization of capillary pressure saturation relationships (0.5 cl.)
11. Darcy's Law in unsaturated systems, relative permeability (1 cl.)
12. Computer laboratory time (2 cl.)
13. Laboratory experiment (1cl)
14. Project Presentations (1 cl.)
15. Exams (2 cl.)

Class/laboratory schedule: One 180-minute lecture per week.

Computer Usage: Visual MODFLOW, spreadsheets, presentation software

Design Projects: Remediation system design project

Laboratory Projects: Unsaturated soil drainage/imbibition behavior laboratory

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences - 0 credit hours or 0%
Engineering Science - 2 credit hours or 67%
Engineering Design - 1 credit hour or 33%

Relationship of Course to Program Outcomes:
1.1.: iv
2.1: iv

Relationship of Course to ABET Criterion 3 (a – k)
a, c, e, j, k

Prepared by: Tohren Kibbey **Date:** March 2, 2005

CE 5873 - Water Quality Management
Fall 2004
Elective

2003-2006 Catalog Data: **5873 Water Quality Management.** Prerequisite: senior or graduate standing. Water quality in lakes, rivers, estuaries; chemical, physical and biological aspects of marine and fresh waters; waste assimilation; system modeling; water quality management, waste load allocation, and engineer controls. (Sp)

Prerequisite: Senior or graduate standing

Textbook(s) and/or other required material:
Principles of Water Quality Modeling and Control. Thomman and MuellerHarper Collins Publishers, Inc. ISBN 0-06-046677-4. 1987

Course Objectives: Introduce the student to basic principles of water quality modeling and control. The course will emphasize the processes affecting water quality in diverse water bodies (rivers, lakes, and estuaries) as well as provide some simple tools to assess the impacts of discharges and engineering controls. These topics are at the heart of the waste load allocation process, which is used to assign allowable discharges to meet a designated standard through engineering controls.

Coordinator: Dr. Baxter E. Vieux, Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Introduction to Environmental Biology and Chemistry
2. Fluid flow concepts
3. Calculus/statistics/differential equation
4. Computer operations and programming

Topics:
1. Environmental laws
2. Water characteristics—physical, chemical, biological
3. Types and sources of pollution
4. Process fundamentals
5. Transport mechanisms
6. Phosphorus and Eutrophication
7. BOD-NO systems and models
8. 2-dimensional models
9. Water quality management models
10. Engineering Controls

Class/laboratory schedule: Two 75-minute lectures per week

Computer Usage: Various personal computer software packages are demonstrated to students and made available for use. Students develop analytical computer solutions using spreadsheets.

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
1. Standard course evaluation.

Contribution to Professional Component:
Math and Basic Sciences 0 credit hours or 0%
Engineering Science - 2 credit hours or 67%
Engineering Design - 1 credit hour or 33%

Relationship of Course to Program Outcomes:
1.1: iv
2.1: iv

Relationship of Course to ABET Criterion 3 (a – k):
a, c, e, j, k

Prepared by: Baxter E. Vieux **Date:** February 11, 2005

CHEM 1315 – General Chemistry
Fall 2004
Required

2003-2006 Catalog Data: **1315 General Chemistry.** Prerequisite: Mathematics 1503 or 1643, or math ACT equal to or greater than 23. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, gas laws and changes in state, stoichiometry, atomic theory, electron configuration, periodicity, bonding, molecular structure and thermochemistry. **Laboratory** (F, Sp, Su) [II-LAB]

Prerequisite(s): MATH 1503, or high school chemistry and MATH 0123, or a satisfactory score on the mathematics placement test.

Textbook(s) and/or other required material:
McMurry and Fay, "Chemistry" 2^{nd} edition, Prentice Hall, 1998

Course Objectives: First semester of two-semester sequence introducing general chemical concepts and procedures

Coordinator: Dr. M. R. Abraham, Department of Chemistry and Biochemistry

Prerequisites by Topic: Basic Algebra

Topics: Basic concepts in general chemistry; stoichiometry; thermochemsitry; atomic structure; molecular structure; gases liquids; solids; solutions; organic chemistry.

Class/laboratory schedule: 3 periods of 50 minutes lecture with 3 hours of laboratory and 50 minutes of recitation per week

Computer Usage: None

Design Projects: None

Laboratory Projects: General experiments in in general chemistry; stoichiometry; thermochemsitry; atomic structure; molecular structure; gases liquids; solids; solutions; organic chemistry.

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences – 5 credit hours or 100%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:
1.1: iii, v

Relationship of Course to ABET Criterion 3 (a – k):
a, b

Prepared by: K.A. Strevett **Date**: May 14, 2005

CHEM 1415 - General Chemistry
Spring 2004
Required

2003-2006 Catalog Data: **CHEM 1415: General Chemistry.** Prerequisite: CHEM 1315, or a satisfactory score on the chemistry placement examination. Topics covered include nature of solutions, equilibrium, thermodynamics, acid and base properties, kinetics and electrochemistry. **Laboratory** (F, Sp, Su)

Prerequisite: CHEM 1315, or a satisfactory score on the chemistry placement examination.

Textbook(s) and/or other required material:
McMurry and Fay, "Chemistry" 2^{nd} edition, Prentice Hall, 1998

Course Objectives: First semester of two-semester sequence introducing general chemical concepts and procedures

Coordinator: Various Instructors, Department of Chemistry and Biochemistry

Prerequisites by Topic: General Chemistry I

Topics: Basic concepts in kinetics; equilibrium; acids and bases; aqueous equilibrium; chemical thermodynamics; electrochemistry; nuclear chemistry; coordination chemistry..

Class/laboratory schedule: Three 50-minute lectures, one 120-minute laboratory sessions and one 50-minute period of recitation per week.

Computer Usage: None

Design Projects: None

Laboratory Projects: General experiments in kinetics; equilibrium; acids and bases; aqueous equilibrium; chemical thermodynamics; electrochemistry; nuclear chemistry; coordination chemistry.

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component
Math and Basic Sciences – 5 credit hours or 100%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:
1.1: iii, v

Relationship of Course to ABET Criterion (a – k)
a, b

Prepared by: K.A. Strevett **Date**: May 14, 2005

ENGR 1410 Freshman Engineering Orientation I
Fall 2004
Required

2003-2006 Catalog Data: **1410 Freshman Engineering Orientation I.** Prerequisite: declared major in engineering. All entering freshmen with a declared engineering major are required to enroll. One hour of this seminar a week is in a large group setting where all students meet and cover details on all engineering disciplines. Additional topics would be continuums of majors, success in the College of Engineering, success at the University of Oklahoma, study abroad programs, advising issues, graduate school opportunities, career planning, and information related to technical/honor societies and participation. A second hour a week is a required small group session with an upper-class mentor from the College of Engineering Dean's Leadership Council. This second hour will focus on basic enrollment and retention strategies such as adding and dropping classes and choosing electives in addition to a weekly topic area. (F)

Prerequisites: declared major in engineering.

Textbook: The University of Oklahoma Class of 2008 Graduation Planner. Please note that *additional inserts to the planner specific to the College of Engineering will be provided. Readings may be placed in the engineering library when appropriate course content is being covered.*

References:

1. Donaldson, Krista (2002). The Engineering Student Survival Guide (B.E.S.T. Series). McGraw-Hill.

2. Schiavone, Peter (2002). Engineering Success, Second Edition, Prentice Hall.

3. King, Joe (2002). Exploring Engineering, Second Edition, Prentice Hall.

Course Objectives: The objectives of this course are to provide the student with an opportunity to acquire fundamental knowledge of the University of Oklahoma, the College of Engineering and the field of engineering. One hour of this seminar a week is in a large group setting where all students meet and cover details on all engineering disciplines. Additional topics would be continuums of majors, success in the CoE, success at the University of Oklahoma, study abroad programs, advising issues, graduate school opportunities, career planning, and information related to technical/honor societies and participation. A second hour a week is a required small group session with an upper-class mentor from the College of Engineering Dean’s Leadership

Council. This second hour will focus on basic enrollment and retention strategies such as adding and dropping classes and choosing electives in addition to a weekly topic area.

Topics Covered:

1. Leadership
2. Careers in engineering
3. Engineering disciplines
4. Time management
5. Note taking skills
6. Student honor code
7. Advising

Computer Usage: None

Schedule: One session per week divided into one hour of lecture/presentation and one hour of mentoring with an upperclassman (Dean's Leadership Council Mentor).

Laboratory Projects: None

Assessment Methods Used:

1. Standard course evaluation

Contribution of course to meeting the professional component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:

2.1:ii

Relationship of Course to ABET Criterion 3 (a – k):

f, g, h, i, j

Prepared by: Teri Reed Rhoads **Date:** June, 2005

ENGR 1420 Freshman Engineering Orientation II
Spring 2005
Core Required

2003-2006 Catalog Data: **1420 Freshman Engineering Orientation II.** Prequisite: declared major in engineering. All entering freshmen with a declared engineering major are required to enroll in this spring continuation course. One hour of this seminar a week is in a large group setting where all students meet and cover details on all engineering disciplines. Additional topics would be continuums of majors, success in the College of Engineering, success at the University of Oklahoma, study abroad programs, advising issues, graduate school opportunities, career planning, and information related to technical/honor societies and participation. A second hour a week is a required small group session with an upper-class mentor from the College of Engineering Dean's Leadership Council. This second hour will focus on basic enrollment and retention strategies such as adding and dropping classes and choosing electives in addition to a weekly topic area. (Sp)

Prerequisites: Declared major in engineering.

Textbook(s) and/or other required material: The University of Oklahoma Class of 2008 Graduation Planner. Please note that *additional inserts to the planner specific to the College of Engineering will be provided. Readings may be placed in the engineering library when appropriate course content is being covered.*

Course Objectives: The objectives of this course are to provide the student with an opportunity to acquire fundamental knowledge of the University of Oklahoma, the College of Engineering and the field of engineering. One hour of this seminar a week is in a large group setting where all students meet and cover details on all engineering disciplines. Additional topics will be success in the CoE, success at the University of Oklahoma, study abroad programs, advising issues, graduate school opportunities, career planning, teaming, ethics, globalization, diversity, and information related to technical/honor societies and participation.

Topics:

8. Learning Styles
9. Minors, Graduate School, REU
10. Advising
11. The Engineering Curriculum – What lies ahead
12. Interviewing Skills/Resumes/Corporate Panel Discussions
13. Teaming
14. Ethics
15. Engineering Resources (Library, ECS)
16. Globalization/Diversity

Computer Usage: None

Class/Laboratory Schedule: One 55-minute lecture/presentation per week with additional outside participation points required.

Laboratory Projects: None

Assessment Methods Used:

2. Standard course evaluation

Contribution of course to meeting the professional component:

Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:

2.1:ii

Relationship of Course to ABET Criterion 3 (a – k):

f, g, h, i, j

Prepared by: Teri Reed Rhoads **Date:** June, 2005

ENGR 2003 – ENGINEERING PRACTICE I
Spring 2004
Required

2003-2006 Catalog Data: **2003 Engineering Practice 1.** Prerequisite: 1410, 1420, and English 1213. Introduction to basic principles of successful engineering enterprise. (Sp)

Prerequisites: ENGR 1410, ENGR 1420 or ENGR 3410 ***and*** ENGL 1213

Textbook(s) and/or other required material:

1. Oakes, William C.; Leone, Les L.; Gunn, Craig J. (2004). **Engineering Your Future**, Great Lakes Press, Inc.
2. Holloway, Brian (2005). **Technical Writing Basics** Pearson Prentice Hall.
3. Smith, Karl A. (2004). **Teamwork and Project Management (B.E.S.T. Series).** McGraw-Hill.

Other required reading include selected chapters from the following (OU Library Electronic Reserve):

4. Stanley, Andy (1999); **Visioneering**.
5. Kouzes, James M.; Posner, Barry Z. (2002). **The Leadership Challenge**.
6. Collins, Jim (2001). **Good to Great**.
7. Kotter, John P. (1996). **Leading Change.**
8. Zimmer, Thomas W.; Scarborough, Norman M. (2005). **Essentials of Entrepreneurship and Small Business Management**.
9. Dorf, Richard C.; Byers, Thomas H (2005). **Technology Ventures from Ideas to Enterprise.**

Course Objectives: **Inspire personal vision** within each class member to **picture what could be** and introduce professional topics and the engineering design and problem solving process via an engaging, interactive class experience for students to **develop a context and framework for successfully *Engineering Their Future(s)*.**

Coordinator: Matthew B. Green, Instructor, College of Engineering

Prerequisites by Topic: Freshman Orientation I and Freshman Orientation II or Engineering Economics and Principles of English Composition

Topics:

17. Vision
18. Communication
19. Team Building
22. Creative Problem Solving
23. Engineering Design
24. Entrepreneurship / Intrpreneurship

20. Project Management
21. Leadership
25. Engineering Economics
26. Technology Development

Computer Usage: Individual assignments and Team Case Studies are typically submitted electronically via email as PDF files. Assignments are typical created utilizing MS Office.

Class/laboratory schedule: Two 75-minutes lectures per week

Laboratory Projects: None

Assessment Methods Used:
Standard course evaluation

Contribution of course to meeting the professional component:
Math and Basic Sciences – 0 credit hours or 0%
Engineering Science – 3 credit hours or 100%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:
1.2: i, ii, iii; 1.3: ii
2.1: ii; 2.2: ii; 2.3: i, iii

Relationship of Course to ABET Criterion 3 (a – k):
c, f, g, h, j

Prepared by: Matthew B. Green, Instructor **Date:** June, 2005

ES 2313 – Introduction to Mass Balance and Fate Processes
Fall 2004
Required

2003-2006 Catalog Data: **ES 2313: Introduction to Mass Balance and Fate Processes.** Prerequisite: Chemistry 1415, Mathematics 2423. Introduction to environmental mass balance and fate processes. Studies of mass and energy transfer, introductory environmental chemistry, water quality parameters, mathematics of growth, statistics and data analysis, introduction to environmental laws and regulations. (F)

Prerequisites: Chemistry 1415, Mathematics 2423

Textbook(s) and/or other required material:
Mihelcic, J. R. (1999), *Fundamentals of Environmental Engineering*, John Wiley and Sons, New York, 335 pp.
Course pack of supplemental required reading.

Course Objectives:
(1) Solve basic mass and energy balance problems in environmental science and engineering
(2) Apply fundamental chemistry concepts to environmental problems
(3) Understand basic water quality parameters and their impacts on streams and lakes
(4) Assess trends and uncertainties in environmental measurements using fundamental statistical techniques

Coordinator: Dr. Elizabeth C. Butler, Associate Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Introductory chemistry
2. Calculus
3. Introductory physics

Topics:
Week 1: Units of concentration for air, water, soil, and biota
Weeks 2-3: Mass balances
Week 4: Energy balances
Week 5: Clean Air Act/chemical thermodynamics
Week 6: Chemical equilibrium problems
Week 7: Air/liquid equilibria
Week 8: Water quality field sampling trip
Week 9: Air/water equilibria
Week 10: Chemical kinetics
Week 11: Clean Water Act; Safe Drinking Water Act

Week 12: Suspended and dissolved solids: oxygen demanding wastes
Week 13: BOD kinetics; impact of BOD on streams and rivers
Week 14: Nutrients/eutrophication
Week 15: Data uncertainty/statistics
Week 16: Problem solving

Class/laboratory schedule: Two 75 minute lectures per week

Computer Usage: Word processing for writing and spreadsheets for graphics and statistical calculations.

Design Projects: None

Laboratory Projects: No laboratory projects, but there is a field trip in which students use test kits to assess the water quality of a local pond.

Assessment Methods Used:
1. Standard course evaluation
2. Review of course written submittals

Contribution to Professional Component:
Math and Basic Sciences - 2 credit hours or 67%
Engineering Science – 1 credit hour or 33%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:
1.1: ii; 1.2: i, iii
2.3: i, ii

Relationship of Course to ABET Criterion 3 (a – k)
a, d, e, g

Prepared by: Elizabeth C. Butler **Date:** February 11, 2005

MATH 1823 Calculus and Analytic Geometry I
Fall 2005
Required

2003-2006 Catalog Data: **1823 Calculus and Analytic Geometry I.** Prerequisite: 1523 at OU, or satisfactory score on the placement test, or satisfactory score on the ACT/SAT. Topics covered include equations of straight lines; conic sections; functions, limits and continuity; differentiation; maximum-minimum theory and curve sketching. A student may not receive credit for this course and 1743. (F, Sp, Su) [I-M]

Prerequisite: MATH 1523 at OU or satisfactory score on the placement test or satisfactory score on the ACT/SAT

Textbook(s) and/or other required material:
Calculus (5th ed.) by James Stewart, Brooks/Cole, 1999

Course Objectives: Students will learn the basic concepts of single-variable, differential calculus, as well as its applications to curve sketching and maximum/minimum problems.

Coordinator: Dr. E. Cline, Professor of Mathematics

Prerequisites by Topic: College algebra, trigonometry, elementary analytic geometry

Topics:
1. Functions and their graphs
2. Limits and continuity of functions
3. Tangent lines and the derivative
4. Differentiation formulae, chain rule, implicit differentiation
5. The derivative as a rate of change, related rate problems
6. Newton's method
7. Curve sketching using the derivative (including concavity, inflection points, asymptotes)
8. Applied max-min problems

Class/laboratory schedule: Three 50-minute lectures per week; one 50-minute discussion section per week

Computer Usage: TI-85 graphing calculator

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:

1. Standard course evaluation

Contribution to Professional Component:

Math and Basic Sciences - 3 credit hours or 100%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:

1.1: iii

Relationship of Course to ABET Criterion 3 (a – k):

a

Prepared by: K.A. Strevett **Date**: May 14, 2005

MATH 2423 - Calculus and Analytic Geometry II
Spring 2005
Required

2003-2006 Catalog Data: **2423 Calculus and Analytic Geometry II.** Prerequisite: 1823. Integration and its applications; the calculus of transcendental functions; techniques of integration; and the introduction to differential equations. A student may not receive credit for this course and 2123. (F, Sp, Su) [I-M]

Prerequisite(s): MATH 1823

Textbook(s) and/or other required material:
Calculus (5th ed.) by James Stewart, Brooks/Cole, 1999

Course Objectives: Students will learn the basic concepts of single-variable, integral calculus, as well its applications to area, work, centers of mass, etc.

Coordinator: Dr. E. Cline, Professor of Mathematics

Prerequisites by Topic: See topics for MATH 1823

Topics:

2. The area problem and the definition of the definite integral
3. The fundamental theorem of calculus and the substitution rule
4. Applications to areas and volumes, work, and the average value of a function
5. Exponential and logarithmic functions, applications to growth and decay models
6. Indeterminate forms and l'Hospital's rule
7. Techniques of integration (parts, trig substitutions, etc.)
8. Numerical integration
9. Improper integrals
10. Elementary differential equations
11. Arc length and other applications

Class/laboratory schedule: Three 50 minute lectures per week; one 50 minute discussion section per week

Computer Usage: TI-85 graphing calculator

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:

1. Standard course evaluation

Contribution to Professional Component:

Math and Basic Sciences - 3 credit hours or 100%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:

1.1: iii

Relationship of Course to ABET Criterion 3 (a – k):

a

Prepared by: K.A. Strevett **Date**: May 14, 2005

MATH 2433 - Calculus and Analytic Geometry III
Fall 2004
Required

2003-2006 Catalog Data: **2433 Calculus and Analytic Geometry III.** Prerequisite: 2423. Polar coordinates, parametric equations, sequences, infinite series, vector analysis. (F, Sp, Su)

Prerequisite(s): MATH 2423

Textbook(s) and/or other required material:
Calculus (5th ed.) by James Stewart, Brooks/Cole, 1999

Course Objectives: This course serves as a bridge between single and multivariable calculus. Students will learn the basic concepts concerning parametric equations, sequences and infinite series, three-dimensional coordinate systems and vectors

Coordinator: Dr. T.J. Murphy, Associate Professor, Department of Mathematics

Prerequisites by Topic: See topics for MATH 2423

Topics:
2. Curves defined by parametric equations
3. Tangents to and areas enclosed by parametric curves
4. Polar coordinates
5. Sequences and series
6. Tests for convergence of series (integral test, comparison test, root/ratio test, etc.)
7. Power series, Taylor and MacLaurin series
8. Three-dimensional coordinate systems and vectors
9. Vector dot and cross products, equations of lines and planes
10. Quadric surfaces
11. Vector functions, arc length, space curves (velocity and acceleration)
12. Cylindrical and spherical coordinates

Class/laboratory schedule: Three 50 minute lectures per week

Computer Usage: None

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences - 3 credit hours
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:
1.1: iii

Relationship of Course to ABET Criterion 3 (a – k):
a

Prepared by: K.A. Strevett **Date**: May 14, 2005

MATH 2443 - Calculus and Analytic Geometry IV
Spring 2005
Required

2003-2006 Catalog Data: **2443 Calculus and Analytic Geometry IV.** Prerequisite: 2433. Vector calculus; functions of several variables; partial derivatives; gradients, extreme values and differentials of multivariate functions; multiple integrals; line and surface integrals. (F, Sp, Su)

Prerequisite(s): MATH 2433

Textbook(s) and/or other required material:
Calculus (5^{th} ed .) by James Stewart, Brooks/Cole, 1999

Course Objectives: Students will learn the basic concepts of multivariable differential and integral calculus

Coordinator: Dr. T.J. Murphy, Associate Professor, Department of Mathematics

Prerequisites by Topic: See topics for MATH 2433

Topics:

2. Functions of several variables, limits and continuity
3. Partial derivatives, tangent planes and differentials, the chain rule for partial derivatives
4. Directional derivatives and gradients
5. Max/min problems, Lagrange multiplier method
6. Double and triple integrals, surface area, volumes, and other applications
7. Double integrals in polar coordinates, triple integrals in cylindrical and spherical coordinates
8. Vector fields, line integrals, Green's theorem
9. Divergence and curl of a vector field
10. Parametric surfaces, surface integrals, and surface area
11. Stokes' theorem and the divergence theorem

Class/laboratory schedule: Three 50 minute lectures per week

Computer Usage: A software package is used in selected sections

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:

1. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences - 3 credit hours or 100%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:
1.1: iii

Relationship of Course to ABET Criterion 3 (a – k):
a

Prepared by: K.A. Strevett **Date**: May 14, 2005

MATH 3113 – Introduction to Ordinary Differential Equations
Spring 2005
Required

2003-2006 Catalog Data: †**G3113: Introduction to Ordinary Differential Equations.** Prerequisite: 2443 or concurrent enrollment. Duplicates two hours of 3413. First order ordinary differential equations, linear differential equations with constant coefficients, Laplace transformations, power-series solutions of differential equations, Bessel functions. (F, Sp, Su)

Prerequisite(s): MATH 2443 or concurrent enrollment

Textbook(s) and/or other required material:
Differential Equations and Boundary Value Problems by C. H. Edwards and D. E. Penney, Prentice Hall, 1996

Course Objectives: Students will learn solution methods for the most common types of ordinary differential equations and will be exposed to modeling applications involving ordinary differential equations (ODEs)

Coordinator: Dr. S. Gutman, Professor, Department of Mathematics

Prerequisites by Topic: Single-variable differential and integral calculus, infinite series (see the topics for MATH 1823, 2423, 2433 for details)

<u>Topics:</u>

2. First-order differential equations
3. Introduction to mathematical models
4. Solution methods for linear ODEs of higher order (including variation of parameters and constants)
5. Mechanical vibrations
6. First-order systems of ODE's including eigenvalue methods
7. Laplace-transform methods

Class/laboratory schedule: Three 50 minute lectures per week

Computer Usage: The software package *MathLab* or the TI-92 calculator are used in selected sections

Design Projects: None

Laboratory Projects: None

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Math and Basic Sciences - 3 credit hours or 100%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:
1.1: iii

Relationship of Course to ABET Criterion 3 (a – k):
a

Prepared by: K.A. Strevett **Date**: May 14, 2005

PHYS 2514 General Physics for Engineering and Science Majors

Spring 2005

Required

2003-2006 Catalog Data: **2514 General Physics for Engineering and Science Majors.** Prerequisite: Mathematics 1823. Not open to students with credit in 1205.Vectors, kinematics and dynamics of particles, work and energy systems of particles, rotational kinematics and dynamics, oscillations, gravitation, fluid mechanics, waves. (F, Sp, Su) [II-NL]

Prerequisites: Mathematics 1823, not open to students with credit in 1205.

Required Materials:

1) Physics for Scientists and Engineers, a Strategic Approach, Vol. 1, by Randall D. Knight
2) Student Workbook for Physics: A Strategic Approach, by Randall D. Knight
3) H-ITT transmitter

Course Objectives: To introduce engineering students to the physical principles governing mechanical systems

Topics Covered:

27. Concepts of Motion
28. Kinematics: the Mathematics of Motion
29. Vectors and Coordinate Systems
30. Force and Motion
31. Dynamics I: Motion Along a Line
32. Dynamics II: Motion in a Plane
33. Dynamics III: Motion in a Circle
34. Newton's Third Law
35. Impulse and Momentum
36. Energy
37. Work
38. Newton's Theory of Gravity
39. Rotation of a Rigid Body
40. Oscillations
41. Fluids and Elasticity

Computer Usage:

1) The Hyper-Interactive Teaching Technology (H-ITT) system was used to assess students' knowledge. During lectures students asked questions to test their understanding. Their answers were submitting using H-ITT transmitters, and the results were used by the instructor to decide the pace of the class.
2) Quizzes, homework, solutions, notes, tutorials, and discussions all utilized the web.

Class/laboratory Schedule: Three 50-minute lectures per week

Laboratory Projects: None

Assessment Methods Used:

1. Standard course evaluation

Contribution of course to meeting the professional component:

Math and Basic Sciences - 4 credit hours or 100%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of Course to Program Outcomes:

1.1:iii

Relationship of Course to ABET Criterion 3 (a – k):

a, b

Prepared by: Bruce Mason, Associate Professor of Physics **Date:** June 2005

PHYS 2524 General Physics for Engineering and Science Majors

Fall 2004

Required

2003-2006 Catalog Data: **2524 General Physics for Engineering and Science Majors.** Prerequisite: 2514 and Mathematics 2423. Not open to students with credit in 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)

Prerequisites: PHYS 2514 and Mathematics 2423, not open to students with credit in 1215

Textbooks and/or other required material:

1) Physics for Scientists and Engineers, a Strategic Approach, Vol. 2 & 4, by Randall D. Knight
2) Student Workbook for Physics: A Strategic Approach, by Randall D. Knight
3) H-ITT transmitter

Course Objectives: To introduce engineering students to the physical principles governing electromagnetic systems and radiation.

Topics Covered:

42. A Macroscopic Description of Matter
43. Work, Heat, and the First Law of Thermodynamics
44. The Micro/Macro Connection
45. Heat Engines and Refrigerators
46. Electric Charges and Forces
47. The Electric Field
48. Gausss's Law
49. Current and Conductivity
50. The Electric Potential
51. Potential and Field
52. Fundamentals of Circuits
53. The Magnetic Field
54. Electromagnetic Induction
55. Electromagnetic Fields and Waves
56. AC Circuits

Computer Usage:

3) The Hyper-Interactive Teaching Technology (H-ITT) system was used to assess students' knowledge. During lectures students asked questions to test their understanding. Their answers were submitting using H-ITT transmitters, and the results were used by the instructor to decide the pace of the class.
4) Quizzes, homework, solutions, notes, tutorials, and discussions all utilized the web.

Class/laboratory schedule: Three 50-minute lectures per week

Laboratory Projects: None

Assessment Methods Used:
1. Standard course evaluation

Contribution of course to meeting the professional component:
Math and Basic Sciences - 4 credit hours or 100%
Engineering Science – 0 credit hours or 0%
Engineering Design – 0 credit hours or 0%

Relationship of course to Program Outcomes:
1.1:iii

Relationship of Course to ABET Criterion 3 (a – k):
a, b

Prepared by: Bruce Mason, Associate Professor of Physics **Date:** June 2005