Appendix A - Course Syllabi

Appendix A includes a syllabus for each course used to satisfy the mathematics, science, and discipline-specific requirements required by Criterion 5 or any applicable Program Criteria. The syllabi format is consistent for each course, **not exceeding two pages per course**, and, as a minimum, contains the following eleven items of information:

- Department, course number, and title of course
- Designation as a Required or Elective course
- Current University Course Catalog description
- Prerequisites
- Textbook(s) and/or other required material
- Relationship of course to Program Outcomes
- Course learning outcomes
- Topics covered
- Class/laboratory schedule (number of sessions each week and duration of each session)
- Contribution of course to meeting the requirements of Criterion 5
- Person(s) who prepared this description and date of preparation
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CE 1105 - Surveying

Course Description: Calculating closure and area of a traverse; computing offset angles and chord distances to layout circular and spiral curves; determine elevations to layout vertical curves; computing volumes from terrain cross sections. Field problems using surveying instruments to layout a traverse and a circular curve.

Students will work on teams, which will be responsible for performing field work, analytic calculations, and report presentation associated with loop leveling and closed-loop traverse surveys.

Prerequisite: Math 1021 College Algebra or High school mathematics which includes trigonometry as minimum.

Semester: Fall 2008

Instructor: Paul N. Lonie, P.L.S.


Course Learning Objectives (CLO):

1. Provide a practical, hands on learning experience in the area of Land Surveying. (PO a, b)
2. Combine geometric and trigonometric calculations in a real world format, which will bridge from the classroom to the field. (PO a,b,e)
3. Introduce the concepts of accuracy and precision in the area of data capture for a field survey. (PO b, d)
4. Introduce the content of Topographic Survey Plans and the methods of translating this data from field to plan. (PO b, c, d, e)
5. Introduce the legal requirements shown on a survey plan and why they will affect design. (PO e)
6. Introduce earthwork estimation and calculations with real life data capture and actual layout. (PO a, b, d, e)
7. Understand the concept of “Total Quality”, the student must be able to pass their design on to the “surveyor” for layout, with the information that is needed for that layout. (PO a, d, k)

Program Outcomes: a, b, d, e, k

Course Topics:

1. Understand basic concepts of Geometry and Trigonometry (CLO 1, 2).
2. Learn legal aspects of surveying, such as deed reading and plotting (CLO 5),
3. Understand concepts of zoning, planning and code enforcement as shown on survey plans (CLO 5, 7).
4. Ability to use a 100’ measuring tape while understanding the concepts of horizontal measurements (CLO 1, 3).
5. Ability to operate a transit in field exercises by performing angle turning and leveling, and record accurate data (CLO 1, 3).
6. Understanding methods of data capture with a total station, using traversing methodology
7. Ability to gather pertinent data to make earthwork calculations and the ability to lay out your requirements in the field (CLO 4, 6).
CE 2011 - Construction Materials Laboratory

Course Description: Basic laboratory and field tests conducted with aggregate, soil, concrete, steel, masonry, wood, and other construction material. Students are required to submit lab reports on the test results of various materials.

Prerequisite: Math 1021 College Algebra or equivalent


Course Learning Objectives (CLO):
1. Design, and safely conduct experiments on soils and accurately report and evaluate the results (CLO b).
2. Utilize the techniques, skill, and modern engineering tools necessary for successful engineering practice, including teamwork on labs, and practice of oral presentation skills related to engineering (CLO k).
3. Write reports that include all of the following: the appropriate criteria; relevant purpose of a particular test or experiment; appropriate description of the apparatus used; thorough explanation of the procedures used; accurate representation of results obtained; and complete evaluation of the results (CLO g)

Course Outline:
1. Introduction, Course outline, General overview of construction materials, and Laboratory safety (CLO 2, 3).
2. Testing of aggregates for concrete (CLO 1, 2, 3).
3. Proportioning of concrete mixtures and casting of concrete test specimens (CLO 1, 2, 3).
4. Testing of fresh concrete for unit weight, air content, soundness, final and initial setting time (CLO 1, 2)
5. Testing for concrete workability-Slump test, making and curing test specimens (CLO 1, 2, 3)
6. Testing of hardened concrete for compression, split tension and flexure (CLO 1, 2, 3).
7. Testing of metals and reinforcing steel (CLO 1, 2, 3).
8. Testing of masonry (CLO 1, 2, 3).
9. Testing of wood (CLO 1, 2, 3).
10. Soil testing (CLO 1, 2, 3)
CE 2711 - Environmental Chemistry and Microbiology

**Catalog Data:** CE 2711 Environmental Chemistry and Microbiology (3 s.h.) This course covers essential concepts of chemistry and microbiology that are relevant to environmental engineering and science. Fundamental knowledge is applied to understand critical environmental issues, such as water pollution and treatment, acid rain, photochemical smog, global warming, bioremediation, and waste management. [REQUESTED COURSE]

**Prerequisite:** CHEM 1031/1033


**Course Learning Outcomes (CLO):**
1. To learn essential concepts of chemistry and microbiology to understand environmental engineering. (PO a)
2. To apply fundamentals of chemistry and microbiology to understand specific environmental topics, such as water pollution and treatment, biodegradation, and global warming. (PO a,h,k)
3. To perform basic microbiological manipulations and water and wastewater analyses. (PO b)
4. To develop critical thinking about the relationship between human activities and their impact on the environment. (PO h,k)

**Program Outcomes (PO):** a, b, h, k

**Course Topics:**
1. To understand essential concepts of environmental chemistry (CLO 1)
2. To write chemical reactions of aquatic chemistry that are relevant for environmental processes (CLO 1)
3. To describe the structures of the bacterial cell and the major classes of microorganisms that are important for environmental sciences (CLO 1)
4. To describe the major classes of biomolecules and their biological functions (CLO 1)
5. To understand the microbial metabolism and microbial transformations of essential elements (CLO 2)
6. To understand the biodegradation of major classes of contaminants (CLO 2, 4)
7. To understand the concepts of water quality and water pollution (CLO 2, 4)
8. To apply fundamental knowledge of chemistry and microbiology to understand wastewater treatment processes (CLO 2, 4)
9. To perform basic microbiological manipulations, including sterile methods and pathogens enumeration (CLO 3)
10. To perform water and wastewater analyses, including nutrients, suspended solid, alkalinity, BOD, and COD (CLO 3)
11. To understand advanced environmental engineering techniques, such as HPLC, GC-MS (CLO 3)
12. To answer selected questions of the Environmental Engineering PE License Review (CLO 1)

Schedule: The course meets for lecture three hours per week for the semester. Weekly sessions may consist of two 50-minute classes. Five laboratory sessions were substituted to regular lecture sessions. One site visit was organized in the evening to a local wastewater treatment plant.

Student Evaluation: Quizzes 10%
                      Homework 10%
                      Lab reports 10%
                      Student presentation 10%
                      Midterm Exam 20%
                      Midterm Exam 2 20%
                      Final Exam 20%

Computer Usage: The use of spreadsheet software is required some course activities.

Accessibility: Any student who has a need for accommodation based on the impact of a disability should contact me privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at (215) 204-1280 in 100 Ritter Annex to coordinate reasonable accommodations for students with documented disabilities.

Academic Integrity: This course is conducted under the policies and procedures concerning Academic Honesty as published in the Undergraduate Handbook.

Coordinator: Benoit Van Aken, Ph.D.

Date: 01/18/2011
CE 3048 - Probability and Statistics in Engineering


Prerequisite: MATH 1042 (Calculus III) and MATH 3041 (Differential Equations)


Coordinator: S.E. Serrano, Professor.

Goals: To prepare the engineer in the fundamentals of engineering systems analysis under uncertainty.

Course Learning Objective: 1. Understand the basic probabilistic and statistical methods to analyze risk and uncertainty factors in engineering.

ABET category: (a), (b), (k), and (l)

Engineering science: 3.0 credits or 100%
Engineering design: 0.0 credits or 0%

Topics: 1. Uncertainty Analysis in Engineering
2. The Concept of a Random Variable
3. Random Variables and Probability Distributions
4. Simulation of Random Systems (Monte Carlo simulations and analytical techniques)
5. Systems of Jointly Distributed Random Variables
6. Estimation Theory in Engineering
7. Fitting Probability Models to Data
8. Regression Analysis
9. Reliability of Engineering Systems
10. Design of Engineering Experiments
11. Experiments for Two of more Populations. Analysis of Variance
12. Introduction to Stochastic Processes (random walk, Brownian motion, white noise, colored noise)

Course Relevance: Uncertainty analysis provides fundamental knowledge and computational tools to students in all fields of civil engineering. Course prepares students to handle and interpret data subject to errors and approximations, and design engineering crucial in engineering practice.
CE 3211 - Transportation Engineering

Catalog Description: The principal modes of transportation including highway, rail, and air; analysis of elements of transport technology; transportation systems development, planning, design, construction, and maintenance.

Prerequisite: ENGR 2331 Engineering Statics

Text Book: Introduction to Transportation Engineering, Papacostas, Printice Hall, Latest Edition

References: Handouts, Highway Capacity Manual, Transportation Research Board

Course Learning Objectives (CLO):

Successful completion of the course will enable the students to:

1. An ability to design a system, component, or process to meet desired needs, “C.”
2. An ability to identify, formulate, and solve engineering problems, “E.”
3. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice, “K.”

Course Topics

1. Introduction (CLO 1,2; c,k)
2. Air Transportation (CLO 1, 2; c,k)
3. Rail Transportation (CLO 1, 2; c,k)
4. Basic speed-flow-density relationships (CLO 1, 2; c,k)
5. Sight distance (CLO 1, 2; c,k), FE
6. Surveying in Transportation Engineering (CLO 1, 2; c,k), FE
7. Signalized Intersections (CLO 3, k), FE
8. Multilane Highways (CLO 1, 2; c,k), FE
9. Asphalt Paving Technology (CLO 1,2; c,k)
10. Pavement Design-Flexible Pavements (CLO 1, 2; c,k)
11. Pavement Design-Rigid Pavements (CLO 1, 2; c,k)
12. Pavement Rehabilitation (CLO 1, 2; c,k)
13. Pipeline Transportation (CLO 1, 2; c,k)

Grading Formula: Mid Term Exam: 30%;
Final Exam: 40%
Computer assignments: 30%
CE 3311 - Construction Engineering

COURSE DESCRIPTION:

Contracts, construction contract documents, and specifications; estimating construction costs; planning and estimating earthwork, concrete formwork design and estimating; planning and scheduling construction projects, critical path method; project cash flow, funding and cost control; construction equipment: types, ownership and operating costs. Computer applications.

Prerequisite: CE 2341 (Construction Materials Lab), ENGR 2331 (Engineering Statics)


INSTRUCTOR: Philip D. Udo-Inyang, Ph.D., P.E.
Associate Professor of Civil Engineering

COURSE LEARNING OBJECTIVES (CLO):

1. To be able to recognize construction contract documents and the purposes and format of each document. (PO: p)
2. To understand legal issues related to construction contracts and be able to analyze and critique construction court cases. (PO: f, g, p)
3. To understand project organization and the responsibilities of key personnel in a construction organization. (PO: p)
4. To perform estimating of certain construction costs items, including detailed analysis of labor and equipment costs. (PO: e, k)
5. To perform planning and scheduling of construction projects using the critical path method (CPM). (PO: e, k)
6. To perform cash flow analysis and cost control.
7. To understand basic computer applications in construction. (PO: k)

PROGRAM OUTCOMES: e, f, g, k, p

COURSE TOPICS:

1. History and Basic Concepts (CLO 1)
2. Preparing the Bid Package (CLO 1, 2)
3. Laws, Torts, and Contracts (CLO 1, 2)
4. Issues During Construction Phase (CLO 1,2)
5. Construction Contracts (CLO 1,2)
6. Technical Specifications (CLO 1,2)
7. Legal Structure and functions of Key Construction Personnel (CLO 3)
8. Time Planning and Control (CLO 5, 7)
9. Project Cash Flow (CLO 6)
10. Project Funding (CLO 6)
11. Equipment Ownership (CLO 4)
12. Equipment Productivity (CLO 4)
13. Construction Operations (CLO 4, 5)
15. Construction Labor (CLO 4)

COMPUTER USAGE:

Estimating Program (Timberline Software)
Scheduling Program (Primavera Software)
CE 3331 - Soil Mechanics

**PREREQUISITES:** ABET PREREQ- ENGRG 2333.

**CO-REQUISITES:** ABET CE 3332.

**REQUIRED TEXTBOOK**


Bring to every class period (Mandatory).

**COURSE LEARNING OBJECTIVES**

This course will introduce students to the fundamental behavior of soil and the basics of geotechnical engineering. Successful completion of the course will allow students to:

1. Have an understanding of the basic constituents and salient engineering properties of soils and how they applied in geotechnical engineering design (c).
2. Understand basic laboratory testing and interpretation, and application of results to geotechnical analysis and design (c).
3. Develop competencies to identify a geotechnical engineering problem and how to approach such a problem from analysis through design (c,e).

**TOPICS**

4. Geotechnical Engineering (PO c)
5. Origin of Soil and Grain Size (PO c)
6. Weight-Volume Relationships, Plasticity, and Structure of Soil (PO c)
7. Engineering Classification of Soil (PO c)
8. Soil Compaction (PO c)
9. Permeability and Seepage (POs c, e)
10. In Situ Stresses and Stresses in a Soil Mass (POs c, e)
11. Compressibility of Soil (POs c, e)
12. Shear Strength of Soil (POs c, e)
13. Lateral Earth Pressure, Soil-Bearing Capacity for Shallow Foundations and/or Slope Stability (if time permits) (POs c, e)

Topics will be covered in this sequence, unless some modifications are necessary.

**COURSE REQUIREMENTS**

1. Each student should acquaint her/himself with Temple University’s codes policies and procedures involving academic misconduct, grievances, sexual and ethnic harassment and discrimination based on physical handicap. A good source of guidance can be found at [http://www.temple.edu/bulletin](http://www.temple.edu/bulletin)
2. Clarity in writing homework assignments and exams.
   a. State assumptions
b. Cite references (if any)
c. Provide units (Important)
d. Use straight edges and/or French curve (if needed).

3. Cell phones must be turned off during the class and exam periods.
4. Homework assignments are usually assigned at the end of each chapter. It must be submitted before the start of class (at 02:00 PM) on the due date. Twenty percent of an assignment’s full value will be deducted for each day; after the due time, hours are rounded to one day. For homework assignments submitted after graded assignments are returned to class or the solutions are posted, no points can be earned. Use engineering problem paper for homework assignments (50% will be deducted if different papers are used).

**GRADING**
1. (70%) three tests. Two term exams (20% each) and one final exam (30%). The term exams will be based on the objectives of the lessons covered in the one-third of the course.
2. (25%) Homework Assignments.
3. (5%) Quizzes/Notes (will be evaluated at the end of the semester).

**ATTENDANCE**
Lecture attendance is strongly recommended.
Exam attendance is mandatory unless excused (A valid excuse must be submitted on/or before the date of the exam).

**SPECIAL REQUIREMENTS**
If anyone in this class has a disability that may prevent her or him from fully demonstrating his or her abilities, they should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

**Course Description:** Soil as a multiphase material, strength and deformation properties, earth pressure, bearing capacity, stability of slopes, soils laboratory. Written reports and oral presentations required.

**PREREQUISITES:** ENGRG 2333 (Mechanics of Solids)

**CO-REQUISITES:** CE 3332 (Soil mechanics Lab)

**Lectures:** MWF: 02:40 PM -03:30 PM; Location: Engineering & Architecture (E&A) 309.

**Office Hours:** MWF: 12:30 PM – 01:30 PM or by appointment; Location: E&A 415.

**INSTRUCTOR**
Naji Khoury, Ph.D., Assistant Professor Department of Civil and Environmental Engineering Office: E&A 415 Phone no.: 215-204-7814 E-mail: nkhoury@temple.edu
REQUIRED TEXTBOOK


Bring to every class period (Mandatory).

COURSE OBJECTIVES

This course will introduce students to the fundamental behavior of soil and the basics of geotechnical engineering. Successful completion of the course will allow students to:

1. Have an understanding of the basic constituents and salient engineering properties of soils.
2. Describe/apply the laboratory experiments necessary to identify the engineering properties of soils.
3. Develop competencies to identify a geotechnical engineering problem and how to approach such a problem from analysis through design.

COURSE REQUIREMENTS

1. Each student should acquaint her/himself with Temple University’s codes policies and procedures involving academic misconduct, grievances, sexual and ethnic harassment and discrimination based on physical handicap. A good source of guidance can be found at http://www.temple.edu/bulletin
2. Clarity in writing homework assignments and exams.
   a. State assumptions
   b. Cite references (if any)
   c. Provide units (Important)
   d. Use straight edges and/or French curve (if needed).
3. Cell phones must be turned off during the class and exam periods.
4. Homework assignments are usually assigned at the end of each chapter. It must be submitted before the start of class (at 02:40 PM) on the due date. Twenty percent of an assignment’s full value will be deducted for each day; after the due time, hours are rounded to one day. For homework assignments submitted after graded assignments are returned to class or the solutions are posted, no points can be earned. Use engineering problem paper for homework assignments (50% will be deducted if different papers are used).

GRADING

1. (70%) three tests. Two term exams (20% each) and one final exam (30%). The term exams will be based on the objectives of the lessons covered in the one-third of the course. The final exam is comprehensive.
2. (20%) Homework Assignments.
3. (5%) Quizzes.
4. (5%) Notes (Will be evaluated at the end of the semester).

TOPICS

Geotechnical Engineering Origin of Soil and Grain Size Weight-Volume Relationships, Plasticity, and Structure of Soil Engineering Classification of Soil Soil Compaction Permeability and Seepage In Situ Stresses and Stresses in a Soil Mass Compressibility of Soil Soil Shear Strength of Soil Lateral Earth Pressure Soil-Bearing Capacity for Shallow Foundations and/or Slope Stability (if time permits)
Topics will be covered in this sequence, unless some modifications are necessary.

**ATTENDANCE**
Lecture attendance is strongly recommended.
Exam attendance is mandatory unless excused (A valid excuse must be submitted on/or before the date of the exam).

**SPECIAL REQUIREMENTS**
If anyone in this class has a disability that may prevent her or him from fully demonstrating his or her abilities, they should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.
CE 3332 - Soil Mechanics Laboratory

**Course Description:** Students will work on teams, which will be responsible for performing laboratory work, analytic calculations, and report preparation associated with soil classification according to USCS and AASHTO systems and with soil compaction according to ASTM specifications.

*Prerequisite:* ENGRG 2333 *Mechanics of Solids* *Co-Requisite:* CE 3331 *Soil Mechanics*

**Class Schedule:** Monday, Wednesdays 3.40 – 5.30 pm

**Room:** EA 616 (Monday class) and EA 716 (Wednesday class)

**Instructor:** Dr. Felix F. Udoeyo  
Office: EA 530  
Phone: (215)204-7724  
Email: ffudoeyo@temple.edu  
Office hours: Tuesday and Friday, 2-4PM

**Textbooks:** None

**Course Learning Objectives (CLO):**

4. Safely conduct experiments on soils and accurately report and evaluate the results (CLO b).  
5. Utilize the techniques, skill, and modern engineering tools necessary for successful engineering practice, including teamwork on labs, and practice of oral presentation skills related to engineering (CLO k).  
6. Write reports that include all of the following: the appropriate criteria; relevant purpose of a particular test or experiment; appropriate description of the apparatus used; thorough explanation of the procedures used; accurate representation of results obtained; and complete evaluation of the results (CLO g)

**Course Outline:**

11. Introduction, Laboratory safety, and course outline, geotechnical exploration.  
13. Soil Classification.  
14. Soil Compaction.  
15. Permeability and Seepage.  
16. Oedometer Test.  
17. Direct Shear Test.  
18. Unconfined Compression Test.  
19. Triaxial test
**CE 3334 - Structural Design of Pavements**

**REQUIRED TEXTBOOK**


Bring to every class period (Mandatory).

**PROGRAM OUTCOMES (c, g, & k)**

c: an ability to design a system, component, or process to meet desired needs  
g: an ability to communicate effectively  
k: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**COURSE OBJECTIVES**

It will provide students in-depth understanding of the principles and methods involved in structural design of pavements. Students will have the ability to:

14. Describe the basic characteristics and the various modes of failure and design of pavement structures (**POs: c & k**).
15. Identify and analyze the stresses, strains and deflection in flexible and rigid pavements (**POs: c & k**).
16. Compute the traffic loading and volume for the structural design of pavements (**PO: c**).
17. Understand the salient engineering properties of pavement materials and how they affect the performance/design of a pavement structure (**PO: c**)
18. Develop competencies to design flexible and rigid pavements using empirical and mechanistic-empirical approaches; Students will have the ability to work as a team on pavement design projects, write technical reports and present their projects. (**POs: c, g & k**)

**COURSE REQUIREMENTS**

5. Each student should acquaint her/himself with Temple University’s codes policies and procedures involving academic misconduct, grievances, sexual and ethnic harassment and discrimination based on physical handicap. A good source of guidance can be found at [http://www.temple.edu/bulletin](http://www.temple.edu/bulletin)
6. Clarity in writing homework assignments and exams.  
e. State assumptions  
f. Cite references (if any)  
g. Provide units (Important)  
h. Use straight edges and/or French curve (if needed).
7. Cell phones must be turned off during the class and exam periods.
8. Homework assignments are usually assigned at the end of each chapter. It must be submitted before the start of class on the due date. Twenty percent of an assignment’s full value will be deducted for each day; after the due time, hours are rounded to one day. For homework assignments submitted after graded assignments are returned to class or the solutions are posted, no points can be earned. Use engineering problem paper for homework assignments (50% will be deducted if different papers are used).

**GRADING**

4. (50%) two tests. A midterm exam (20%) and a final exam (30%). The midterm exam will be based on the objectives of the lessons covered in the one-half of the course. The final exam is comprehensive.

5. (20%) Homework Assignments.

6. (20%) Project(s)

7. (5%) Quizzes.

8. (5%) Notes and Class Participation (Will be evaluated at the end of the semester).

**TOPICS (APPROXIMATE ORDER)**

Pavement Engineering (Chapter 1)

Material Characterization (Chapter 7)

Traffic Loading and Volume (Chapter 6)

Flexible Pavement Design (AASHTO 1993 Design & Asphalt Institute procedures) (Chapter 11)

Rigid Pavement Design (AASHTO 1993 Design & PCA procedures) (Chapter 12)

Drainage Design (Chapter 8)

Stresses and Strains in Flexible Pavements (Chapter 2)

Kenlayer Computer Program (Chapter 3)

Stresses and Deflection in Rigid Pavements (Chapter 4)

Kenslabs Computer Program (Chapter 5)

Pavement Performance (Chapter 9)

**ATTENDANCE**

Lecture attendance is strongly recommended.

Exam attendance is mandatory unless excused (A valid excuse must be submitted on/or before the date of the exam).

**SPECIAL REQUIREMENTS**

If anyone in this class has a disability that may prevent her or him from fully demonstrating his or her abilities, they should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.
CE 3411 - Structural Analysis

Catalog Description: CE 3411 Structural Analysis (3 s.h.)
Elastic analysis of statically indeterminate structures using force and deformation methods. Introduction to numerical methods and computer techniques.

Prerequisite by topic: ENGRG 2331 - Statics
ENGRG 2333 – Mechanics of Solids
Co-Requisite: CE 3412 Structural Analysis Laboratory


Program Outcomes (PO)
1. An ability to apply knowledge of mathematics, science and engineering, “a.”
2. An ability to identify, formulate, and solve engineering problems, “e.”
3. Use the techniques, skills, and modern engineering tools necessary for engineering practice, “k.”

Course Learning Objectives (CLO):
1. To have a general understanding of the building code requirement of basic loads on structures.
2. To set up any given problem in an organized manner with accurate free body diagrams.
3. To understand the basic types of structural systems.
4. To draw axial, shear, and bending moment diagrams effectively.
5. To identify an efficient analytical method to analyze statically determinate and indeterminate non-complex structures without an aide of computer.
6. To develop the ability in judging the validity of the solution results that was obtained from computer-based applications.
7. To a greater appreciation of structures and structural engineering.

Course Topics
1. Introduction to structural analysis and the role of structural analysis in structural projects (CLO 1, 3, 5, 7; PO a, e, k)
2. Loads on structures and Codes requirements (CLO 1, 2, 3; PO a, e, k)
3. Basic concepts for analysis; simplification for analysis; types of supports and reaction forces; superposition; statical determinacy and stability; computation of reaction and internal forces by the equations of equilibrium; condition equations (CLO 2, 3, 6; PO a, e, k).
4. Analysis of statically determinate plane and space trusses, types of trusses and truss classification; statical determinacy and stability; sign convention and force representation; method of joints and section (CLO 2, 3, 6; PO a, e, k)
5. Analysis of statically determinate beams and frames; internal forces and sign convention; relationship between load, shear and bending moment; axial, shear, and bending moment diagrams for beams and frames (CLO 2, 3, 4, 6, 7; PO a, e, k)

6. Deflection of beams by the geometric method; differential equation for beam deflection; direct integration method; superposition (CLO 2, 3, 4, 5, 6, 7; PO a, e, k)

7. Deflection of trusses, beams, and frames by the work-energy method; principle of virtual work; conservation of energy and strain energy; Castigliano’s second method; Betti’s law and Maxwell’s law of reciprocal deflections (CLO 2, 3, 4, 5, 6, 7; PO a, e, k)

8. Analysis of statically indeterminate structures by the force method; advantage and disadvantage of statically indeterminate structures, types of analysis, redundant; general procedure for the force method; analysis of beams and trusses, support settlement and elastic supports (CLO 2, 3, 4, 5, 6, 7; PO a, e, k)

9. Approximate analysis of rectangular building frames; assumption for approximate analysis, analysis of vertical loads, analysis of lateral loads by the Portal and the Cantilever method (CLO 2, 3, 4, 5, 6, 7; PO a, e, k)

10. Analysis of statically indeterminate structures by the Moment Distribution method; definitions; moments distribution for beams and frames with and without side sway (CLO 2, 3, 4, 5, 6, 7; PO a, e, k)

11. Influence lines; description of influence lines; construction of influence lines for beams; qualitative influence lines; use of influence line to find maximum respond; absolute maximum shear and moment (CLO 2, 3, 4, 5, 6, 7; PO a, e, k)

Bechara Abboud Ph.D., P.E.
CE 3412 - Structural Analysis, Computer Lab

COURSE DESCRIPTION: Introduction to the basic theory and concepts of the Stiffness Method and the Finite Element Method. Students will gain experience in analyzing structural systems and structural mechanics by general-purpose finite element programs such as STAAD PRO and ANSYS.

PREREQUISITE: ENGRG 2331 - Statics  
ENGRG 2333 – Mechanics of Solids  
Co-Requisite: CE 3411 Structural Analysis

COURSE OBJECTIVES:
1) To introduce the basic theory and concepts of the finite element method.  
2) To gain experience in using general-purpose finite element programs such as STAADIII.

REFERENCES:
1) "Matrix Structural Analysis," By William McGuire and Richard H. Gallagher, John Wiley & Son, NY  

COURSE EVALUATION:
Homework  90 %  
Team Project  10 %

Topics | Section
--- | ---
1.) Matrix Algebra and Linear Equations | Class Notes  
2.) Stiffness Method | Class Notes  
3.) Elastic Spring Stiffness Matrix | Class Notes  
4.) Properties of the Stiffness Matrix | Class Notes  
5.) Assembling Structural Stiffness by Superposition | Class Notes  
6.) General Solution Procedure | Class Notes  
7.) Truss Bar Element | Class Notes  
8.) Beam and Plane Frame Elements | Class Notes
9.) STAAD III
CE 3441 - Steel & Concrete Design

COURSE DESCRIPTION: The course’s design objective is to develop within the student an awareness of the fundamentals that are required to produce safe, functional, and economical steel and reinforced concrete structures, which are in conformance with national building codes and with industry codes, specifications and standards and to formulate applied load criteria and make reasonable assumptions regarding structural behavior. Then through an interactive process, the student will determine the most cost-effective solution.

PREREQUISITIES: CE 3411 Structural analysis

COURSE OBJECTIVES:

1. This course is intended to provide the student with an introduction to one specific area of practice in the Civil Engineering discipline. It is the practice of Structural Engineering. Students, who are interested in becoming Structural Engineers, should take more in-depth, advanced structural engineering courses, which are offered as CE electives.

2. To develop within the student an awareness of the fundamentals which are required to produce safe, functional, and economical steel or reinforced concrete structures, which are in conformance with national with national building codes and with industry codes, specifications and standards.

3. To enable students and Civil Engineers to comprehend the fundamental principles of steel or reinforced concrete behavior and to apply them in the analysis and design of steel or reinforced concrete structures.

4. The student will learn to formulate applied load criteria and make reasonable assumptions regarding structural behavior. Then through iterative process, the student will determine the most cost-effective solution, which will be some combination of: weight savings in the structural members; practicality and ease of field construction; and compatibility with the companion architectural other design requirements.

5. To provide the students with an understanding of the mechanics and methods to design steel or reinforced concrete elements subjected to various load effects including bending, shear, and axial.

6. To apply material from previous classes including Mechanics of Solids (ENGR 2333) and Structural Analysis (CE 3411).

REQUIRED TEXTBOOK AND DESIGN MANUAL


BUILDING DESIGN CODE

“ACI Committee 318, Building Code Requirements for Structural Concrete (ACI 318-05) and Commentary (ACI 318R-05),” by American Concrete Institute (ACI), Farmington Hills, MI, 2005, 442 pp

TECHNICAL HANDBOOK ARTICLES

The intent of providing outside technical articles is to broaden the Student’s general knowledge of steel and concrete design by requiring her/him to study associated information, which is contained in sources outside of the required textbooks and manuals. Thus, the technical articles are to be regarded as supplementary to the associated lecture material and therefore may be serve as the basis of questions for the examinations.

COURSE OUTLINES FOR STEEL STRUCTURAL DESIGN

<table>
<thead>
<tr>
<th>Topics</th>
<th>Sections</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction to Structural Steel</td>
<td>1.1 – 1.20</td>
<td>TBA</td>
</tr>
<tr>
<td>Handout</td>
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<tr>
<td>2. Design of Steel buildings</td>
<td>19.1 – 19.20</td>
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<tr>
<td>Handout</td>
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<tr>
<td>3. Specification, Loads, and Methods of Design</td>
<td>2.1 – 2.15</td>
<td>TBA</td>
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<tr>
<td>Handout</td>
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<tr>
<td>4. Structural Analysis and Computation</td>
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<tr>
<td>Of required Strength</td>
<td>Handout</td>
<td>TBA</td>
</tr>
<tr>
<td>5. Analysis of Tension Members</td>
<td>3.1 – 3.7</td>
<td>TBA</td>
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<tr>
<td>6. design of Tension Members</td>
<td>4.1 – 4.5</td>
<td>TBA</td>
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<tr>
<td>7. Introduction to axially Loaded Compression Members</td>
<td>5.1 – 5.11</td>
<td>TBA</td>
</tr>
<tr>
<td>8. Design of Axially Loaded Compression Members</td>
<td>6.1 – 6.10</td>
<td>TBA</td>
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<td>7.1 – 7.6</td>
<td>TBA</td>
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<tr>
<td>9. Introduction to Beams</td>
<td>8.1 – 8.12</td>
<td>TBA</td>
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<tr>
<td>10. Design of beams for moments</td>
<td>9.1 – 9.9</td>
<td>TBA</td>
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<td>10.1 – 10.9</td>
<td>TBA</td>
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<tr>
<td>11. Connectors</td>
<td>Handout</td>
<td>TBA</td>
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</table>

COURSE OUTLINES FOR REINFORCED CONCRETE STRUCTURAL DESIGN

<table>
<thead>
<tr>
<th>Topics</th>
<th>Sections</th>
<th>Homework</th>
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</thead>
<tbody>
<tr>
<td>1. Introduction</td>
<td>1.1 – 1.3</td>
<td>TBA</td>
</tr>
</tbody>
</table>

TBA
2. Concrete Producing Materials 2.1 - 2.5
   TBA
3. Concrete 3.1 – 3.10
   TBA
4. Reinforced Concrete 4.1 – 4.8
   TBA
5. Flexure in Beams 5.1 – 5.10
   TBA
6. Shear and Diagonal Tension in Beams 6.1 – 6.8
   TBA
7. Serviceability of Beams 8.1 – 8.12
   TBA
8. Combined Compression and Bending: Columns 9.1 – 9.10
   TBA
9. Footings 12.1 – 12.9
   TBA
CE 3611 - Hydraulic Engineering

Elective Course

Course Description: Hydrology and Hydraulic Engineering (3 s.h.)
The course deals with the design of hydraulic systems based on various flow regimes (laminar and turbulent). Students will learn to design pipe and network systems along with open channels. The design of various hydraulic structures such as, culverts and spillways, will be taught. Widely used software such as MWH Soft and HECRAS (US Army Corps of Engineers) will be taught and used in the class. Field studies will be conducted and students will get to experiment with various instruments used in water systems (e.g., pumps, flowmeters, diffuser, etc). NOTE: Prior to spring 2010, the course title was "Hydrology and Hydraulic Engineering."

Prerequisite: ENGRG 3553 Mechanics of Fluids

by Ned H.C. Hwang and Robert J. Houghtalen
http://vig.prenhall.com/catalog/academic/product/0,1144,0131766031,00.html

Tools: Churchill Equation (Excel Spreadsheet) for Darcy-Weisbach $f$ factor
Convert program for unit conversion
Water Density Table (Excel Spreadsheet)
Goulds Pumps – Pump Selection Software

ABET Program Outcomes: D, E, G, K

Course Learning Outcomes (CLO)
1. An understanding of the principals of fluid behavior which are applicable to the fundamental physical properties of water for design. (PO E)
2. An understanding of fluid mechanics applicable to dams, reservoirs, flood control, etc.(PO E)
3. A working knowledge of surface water and ground water hydrology as it applies to the design of water conveying systems. (PO K)
4. An understanding of physical concepts of the fundamental laws of fluid mechanics and the application of the principles to the design of water flow in pipes, open channels, pipe networks, and hydraulic structures. (PO E,K)
5. Knowledge of the use of fluid measurement devices, pumps and tubines in the design of water and wastewater systems. (PO E,K)
6. Participation in a team-based engineering design process. (PO D,E,G,K)

Course Topics
1. Review of fluid mechanics [CLO 1]
2. Pressurized pipe flow; energy ; friction and minor losses; series, parallel, and branching flow; Measurements [CLO 1, 5]
3. Open-channel flow; steady uniform flow; specific energy; measurements [CLO 1, 5]
4. Groundwater flow; steady-state one-dimensional flow; steady-state well hydraulics; transient well hydraulics [CLO 3]
5. Hydrologic cycle and processes [CLO 3]
6. Rainfall-runoff analysis [CLO 3]
7. Drainage basins [CLO 4]
8. Reservoir and stream flow routing [CLO 2, 4]
9. Probability, risk, and uncertainty analysis [CLO 2, 3, 4]
10. Water distribution systems; system components; network simulation; hydraulic transients [CLO 4, 5]
11. Project Assignment; (1) Pipe network and reservoir or (2) rainfall analysis and detention basin design for flood control [CLO 4, 5, 6]
12. Hydroelectric Generation [CLO 2, 4]
13. Stormwater control; sewers and detention; highway drainage and culverts [CLO 2, 4]
14. Hydraulic Structures [CLO 2, 4]

Class and Laboratory Schedule
Lecture: 3 semester hours, 150 minutes per week, 14 weeks per semester
Laboratory: None

Contribution to Meeting Criterion 5 Requirements

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<thead>
<tr>
<th>Curricular Area</th>
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<tbody>
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<tr>
<td>Humanities/Social Sciences</td>
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<td>Basic Engineering</td>
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<tr>
<td>Introductory Civil Engineering</td>
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<tr>
<td>Professional Level Civil Engineering</td>
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</table>

Prepared by  William C. Miller; January, 2008 (revised May 2011)
CE 3711 - Introduction to Environmental Engineering


Course Description: Sources, effect, and control of environmental pollution from an engineering perspective. Significant focus will be on water and air pollution. Solid and hazardous waste, noise, and radiation will also be discussed. Effects across media and applications to current environmental concerns are emphasized. 3 credit hours

Prerequisite(s): CHEM 1031 General Chemistry, MATH 1042 Calculus II

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<th>Date</th>
<th>Topics</th>
<th>Reading</th>
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<tbody>
<tr>
<td>1</td>
<td>9/3</td>
<td>Introduction: Eng. Systems, Env. Laws, Eng Ethics</td>
<td>Ch 1</td>
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<td>9/5</td>
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<td>2</td>
<td>9/8</td>
<td>Materials Balance: Steady State</td>
<td>Ch 2 Ch 2</td>
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<td>Material Balance: Non-Steady State</td>
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<td>9/12</td>
<td>Energy Balance</td>
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<td>3</td>
<td>9/15</td>
<td>Hydrology: Fundamentals</td>
<td>Ch 3 Ch 3</td>
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<td>9/17</td>
<td>Hydrology: Rainfall, Runoff</td>
<td>Ch 3</td>
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<td>9/19</td>
<td>Hydrology: Runoff</td>
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<td>4</td>
<td>9/22</td>
<td>Water Chemistry: Phys. Prop., Reactions</td>
<td>Ch 4 Ch 4</td>
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<td>9/24</td>
<td>Water Chemistry: Reactions, Buffers</td>
<td>Ch 4</td>
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<td>9/26</td>
<td>Water Chemistry: Buffers, Alkalinity</td>
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<td>5</td>
<td>9/29</td>
<td>Q/A Review for Mid-term Exam I (Take Home) Mid Term Exam I DUE</td>
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<td>10/1</td>
<td>Water Treatment: Laws, Regs, Assessment</td>
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<td>10/3</td>
<td>Water Treatment: Coagulation</td>
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<td>Water Treatment: Mixing, Flocculation</td>
<td>Ch 4 Ch 4</td>
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<td>10/8</td>
<td>Water Treatment: Softening</td>
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<td>7</td>
<td>10/13</td>
<td>Water Treatment: Sedimentation</td>
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<td>Water Treatment: Filtration</td>
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<td>8</td>
<td>10/20</td>
<td>Water Treatment: Disinfection</td>
<td>Ch 4 Ch 5</td>
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<td>Water Quality Management: Laws, Regs</td>
<td>Ch 5</td>
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<td>10/27</td>
<td>Water Quality Management: Streeter-Phelps</td>
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<td>10/29</td>
<td>Wastewater Treatment Systems: On-Site, Community, Municipal</td>
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<td>10/31</td>
<td>Wastewater Treatment Stages: Preliminary, Primary</td>
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<td>11/3</td>
<td>Wastewater Treatment Stages: Secondary</td>
<td>Ch 6 Ch 6</td>
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<td>11/5</td>
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<td>11/7</td>
<td>Wastewater Treatment Stages: Tertiary</td>
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<td>Week</td>
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<td>11</td>
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<td>Q/A Review for Mid-term Exam II (Take Home)</td>
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<td><strong>Mid Term Exam II DUE</strong> and</td>
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<td></td>
<td>11/14</td>
<td>Air Pollution: Laws, Regs</td>
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<td>Air Pollution: Env. and Health Effects</td>
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<td>12</td>
<td>11/17</td>
<td>Air Pollution: Atmospheric Conditions and Meteorology</td>
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<td>11/19</td>
<td>Air Pollution: Dispersion Modelling</td>
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<td>Air Pollution: Indoor Modeling</td>
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<td>13</td>
<td>11/24</td>
<td>Air Pollution: Treatment Unit Processes</td>
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<td>14</td>
<td>12/1</td>
<td>Noise Pollution</td>
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<td>12/3</td>
<td>Solid Waste Management</td>
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<td>12/5</td>
<td>Hazardous Waste Management</td>
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<td>15</td>
<td>12/8</td>
<td>Ionizing Radiation</td>
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<td>12/10</td>
<td>Review</td>
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<td>Final Exam</td>
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Ch 7 Ch 7
Ch 7
Ch 7
Ch 7
Ch 8 Ch 9
Ch 10
Ch 11
CE 4211 - Bridge Engineering

Description (official):
Design criteria, loads, construction techniques, state codes, superstructure components design-modeling and analysis, method, rating, computer software, detailing, new bridge, replacement, widening, rehabilitation, state codes, technical proposal, structural planning, feasibility studies, preliminary and final design, and post design services.

Prerequisites:  CE 3441(Steel & Concrete Design),  CE 3211(Transportation Engineering)

Text:
Design of Highway Bridges – AN LRFD Approach, 2nd Edition
Richard M Barker and Jay A Puckett

Goals:
ABET Program Outcomes:

CE 4211 has two Program Outcomes required, "e" and "k". Definitions are as follows.

e. an ability to identify, formulate, and solve engineering problems
k. an ability to use the techniques, skills and modern engineering tools necessary to engineering practice

Course Schedule:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Required Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, structural analysis</td>
<td>Ch1, 2, 5</td>
</tr>
<tr>
<td>AASHTO loads and analysis, distribution factors</td>
<td>Ch 3, 4, 6</td>
</tr>
<tr>
<td>AASHTO loads and analysis, deck and barrier analysis</td>
<td>Ch 3, 4, 6</td>
</tr>
<tr>
<td>Steel beams, flexure</td>
<td>Ch 8.7</td>
</tr>
<tr>
<td>Steel beams, shear</td>
<td>Ch 8.8</td>
</tr>
<tr>
<td>Steel beams, skew and curvature, bracing</td>
<td>Handouts</td>
</tr>
<tr>
<td>Steel beams, connection design</td>
<td>Ch 8.9</td>
</tr>
<tr>
<td>Prestressed concrete, intro and basics of flexure</td>
<td>Ch 7.7</td>
</tr>
<tr>
<td>Prestressing losses and shear</td>
<td>Ch 7.7, 7.8</td>
</tr>
<tr>
<td>Anchor zones, continuity</td>
<td>Handouts</td>
</tr>
<tr>
<td>Piers, loading and analysis</td>
<td>Handouts</td>
</tr>
<tr>
<td>Strut and tie modeling</td>
<td>Handouts</td>
</tr>
<tr>
<td>Abutments and retaining walls</td>
<td>Handouts</td>
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</tbody>
</table>
CE 4221 - Intelligent Transportation Systems


Course Learning Objectives:

1. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice, “K”
2. Proficiency in a minimum of four (4) major civil engineering areas (structural, geotechnical, transportation, construction, environmental, and surveying), “O”
3. An understanding of professional practice issues such as ethics, analytical accuracy and completeness, design criteria, codes and processes, “P”

Course Description: To understand the multidimensional upgrades needed for highway and vehicles to develop intelligent transportation systems. The intelligent transportation system should be able to handle higher traffic safely in lesser time. Several case studies are integral part of the course. Environmental impact of the system will be analyzed.

Prerequisites: Math 1042 (Calculus II)

Course Topics

1. Introduction and Overview of the Course (CLO 1, 3)
2. Vehicle Platoon Systems (CLO 1, 2)
3. Logistics (CLO 1,2)
4. Communication Technologies (CLO 1,2)
5. Control and Sensor Requirements (CLO 1,2)
6. Spacing and Capacity (CLO 1,2)
7. Vehicle Control and Upgrading Systems and Aerodynamics (CLO 1,2)
8. Road Upgrading Systems (CLO 1,2)
9. Satellite Systems (CLO 1,2)
10. Warning and Safety Systems (CLO 1,2)
11. Integration of Heavy Vehicles (CLO 1,2)
12. Integration of ITS into Existing Highways (CLO 1,2)
13. Miscellaneous topics (CLO 1,3)
14. Environmental Impact (CLO 1,2,3)

Course Grading Formula:

Assignments: 25%  Midterm Examination: 25%
Attendance: 5%  Final Examination: 45%
CE 4302 - Engineering Project Management

Elective Course

Course Description: CE 4302 - Engineering Project Management. 3 s.h.
Overview of the basic principles underlying all methods of project management, including project estimating, planning and scheduling, budgeting, cost accounting and cost control, project documentation, tracking and resource leveling. Utilization of project management software packages for selected civil engineering projects. Different types of projects, organizing the project management functions, setting up the project team, starting up and managing engineering projects and ensuring the effective completion of the project on time, within budget and meeting specifications.

Prerequisite: CE 3311 – Construction Engineering

Text: "PROJECT MANAGEMENT: Processes, Methodologies, and Economics"
Published by Prentice Hall, Inc., New Jersey. ISBN: 0-13-041331-3

ABET Program Objectives (PO):

e. an ability to identify, formulate, and solve engineering problems.

Course Learning Outcomes (CLO):

1. To analyze alternatives on a project (PO: e)
2. To perform estimating of certain construction costs items. (PO: e)
3. To perform planning and scheduling of construction projects using the critical path method (CPM). (PO: e)
4. To perform cash flow analysis and cost control (PO: e).

Chapter 1. INTRODUCTION
Chapter 2. PROCESS APPROACH TO PROJECT MANAGEMENT
Chapter 3. ENGINEERING ECONOMIC ANALYSIS [CLO 1]
Chapter 4. LIFE-CYCLE COSTING [CLO 1]
Chapter 5. PROJECT SCREENING AND SELECTION [CLO 1]
Chapter 7. SCOPE AND ORGANIZATIONAL STRUCTURE OF A PROJECT
Chapter 8. MANAGEMENT OF PRODUCTS, PROCESS, AND SUPPORT DESIGN
Chapter 9. PROJECT SCHEDULING [CLO 3]
Chapter 10. RESOURCE MANAGEMENT [CLO 4]
Chapter 11. PROJECT BUDGET (ESTIMATING) [CLO 2]
Chapter 12. PROJECT CONTROL [CLO 4]
Chapter 14. COMPUTER SUPPORT FOR PROJECT MANAGEMENT
Chapter 15. PROJECT TERMINATION

Class and Laboratory Schedule
  Lecture: 3 semester hours, 150 minutes per week, 14 weeks per semester
  Laboratory: None

Contribution to Meeting Criterion 5 Requirements

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<thead>
<tr>
<th>Curricular Area</th>
<th>Percentage</th>
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<tr>
<td>Basic Science &amp; Math</td>
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<tr>
<td>Humanities/Social Sciences</td>
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<tr>
<td>Basic Engineering</td>
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<tr>
<td>Introductory Civil Engineering</td>
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<tr>
<td>Professional Level Civil Engineering</td>
<td>100%</td>
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</tbody>
</table>

Prepared by: Philip D. Udo-Inyang, Ph.D., P.E.
CE 4321 - Geotechnical Engineering

**COURSE DESCRIPTION:**
Soil testing, site investigation, design of shallow and deep foundations, earth retaining structures and advanced topics in soil behavior and stability.

**REQUIRED TEXTBOOK**

**PROGRAM OUTCOMES:** c, e

**COURSE OBJECTIVES**
This course will introduce students to the theoretical and practical fundamentals involved with analysis and design of various types of foundations and earth retaining structures (POs c & e). Topics are:

- Review of Soil Mechanics Principles (PO: e)
- Introduction of Foundation Engineering and Basic Design Philosophies (PO: c)
- Subsurface Exploration (PO: c)
- Shallow Foundation Analysis and Design (POs: c & e)
- Deep Foundation Analysis and Design (POs: c & e)
- Earth Retaining Structures (POs: c & e)
- Slope Stability (if time permits) (POs: c & e)

Topics will be covered in this sequence, unless some modifications are necessary.

**GRADING**
9. (60%) three tests. Two term exams (15% each) and one final exam (30%). The term exams will be based on the objectives of the lessons covered in the one-third of the course. The final exam is comprehensive.
10. (10%) Homework Assignments.
11. (20%) Design project(s)
12. (5%) Quizzes.
13. (5%) Notes (Will be evaluated at the end of the semester).

**COURSE REQUIREMENTS**
9. Each student should acquaint her/himself with Temple University’s codes policies and procedures involving academic misconduct, grievances, sexual and ethnic harassment and discrimination based on physical handicap. A good source of guidance can be found at [http://www.temple.edu/bulletin](http://www.temple.edu/bulletin)
10. Clarity in writing homework assignments and exams.
   i. State assumptions
   j. Cite references (if any)
k. Provide units (Important)
l. Use straight edges and/or French curve (if needed).

11. Cell phones must be turned off during the class and exam periods.
12. Homework assignments are usually assigned at the end of each chapter. It must be submitted before the start of class on the due date. Twenty percent of an assignment’s full value will be deducted for each day; after the due time, hours are rounded to one day. For homework assignments submitted after graded assignments are returned to class or the solutions are posted, no points can be earned. Use engineering problem paper for homework assignments (50% will be deducted if different papers are used).

ATTENDANCE
Lecture attendance is strongly recommended.
Exam attendance is mandatory unless excused (A valid excuse must be submitted on/or before the date of the exam).

SPECIAL REQUIREMENTS
If anyone in this class has a disability that may prevent her or him from fully demonstrating his or her abilities, they should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.
CE 4421 - Dynamics of Structures

Course Description: Basic knowledge of structural dynamics and introduction to earthquake engineering. Formulations and solutions of Single-Degree-of-Freedom (SDF) and Multi-Degree-of-Freedom (MDF) systems under various loading conditions, including free vibration, harmonic loads, and arbitrary loads. Brief introduction to modal analysis to MDF systems.

Prerequisites (ask instructor for waiver):
1. Calculus II, Calculus III, Differential Equations, Linear Algebra
2. Structural Analysis

Textbook:

References:

Course Learning Objectives (CLO):
Structural Dynamics – identify the problems, formulate the equations, develop solutions – Apply knowledge of mathematics, science and engineering (PO a) and identify, formulate, and solve engineering problems (PO e).

Course Outline:
- Introduction to structural dynamics and formulation of the equation of motion.
- Single degree of freedom (SDF) systems, free vibrations of damped and undeamped systems.
- Single degree of freedom systems, responses to dynamic loads.
- Multi-degree of freedom (MDF) system, free vibrations of damped and undamped systems, response to dynamic loads, modal analysis.
CE 4431 - Behavior and Design of Steel Structures

Course Description: Loadings on structures. Design criteria and procedures for steel members subjected to axial forces, bending and shear. Buckling of columns. Design of connections. Plastic design and load factor resistance theories. Computer-based design methods included.

Prerequisite: CE 3441 Steel and Concrete Design


Students are not required to purchase the aforementioned reference; copies will be provided at appropriate times.

Course Learning Objectives (CLO):
Successful completion of this course will enable students to:
1. Have an ability to design a system, component, or process to meet desired needs; Program Outcome “c.”
2. Have an ability to identify, formulate, and solve problems in major; Program Outcome “e”
3. Have an understanding of professional practice issues such as ethics, analytical accuracy and completeness, design criteria, codes and process; Program Outcome “f.”
4. Have an ability to use techniques, skills, and modern engineering tools necessary for engineering practice in major including computers and software; Program Outcome “k.”

Program Outcomes: c, e, f, k

Course Topics:
20. Introduction and Review of Basic Steel Design (CLO 1, 2, 3 & 4).
21. Analysis of Beam-Column (CLO 1, 2, 3, & 4)
22. Design of Beam-Column (CLO 1, 2, 3, & 4)
23. Analysis of Torsion-Laterally Stable Beams (CLO 1, 2, 3, & 4)
24. Design of Torsion-Laterally Stable Beams (CLO, 1, 2, 3 & 4)
25. Lateral-Torsional Buckling of Beams (CLO 1, 2, 3 & 4)
26. Composite Steel-Concrete Beams (CLO 1, 2, 3 & 4)
27. Composite Steel-Concrete Columns (CLO 1, 2, 3 & 4).
28. Shear Connectors(CLO 1, 2, 3, & 4)
29. Riveted Connections (CLO 1, 2, 3, & 4)
30. Bolted Connections (CLO 1, 2, 3, & 4)
31. Welded Connections (CLO, 1, 2, 3 & 4)
CE 4432 - Behavior and Design of Concrete Structures

**COURSE DESCRIPTION:** Behavior, analysis, and design of advanced reinforced concrete structures and components including columns subjected to flexure in one or two directions, slender columns, floor systems including two-way slabs, and analysis, design application using modern software.

*Prerequisite: CE 3441 Steel and Concrete Design*

**TEXTBOOK:**


Building Code Requirements for Structural Concrete (ACI 318-05) and Commentary – (ACI 318R-05) by American Concrete Institute, Farmington Hills, MI.

**COURSE LEARNING OBJECTIVES:**

1. To develop the skills in understanding the interaction between structural analysis and design.
2. To understand the structural behavior of concrete members.
3. To design components of reinforced concrete structures and design the interactions between these components.
4. To become familiar with the design cod of ACI 318.

**Course Outline and Homework Assignment**

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<th>Section</th>
<th>Problem</th>
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<td>2</td>
<td>Serviceability of Beams and One-Way Slabs</td>
<td>8.1 – 8.12</td>
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<td>3</td>
<td>Deep Beams, Brackets and Corbels</td>
<td>6.6, 6.9 – 6.11</td>
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<td>4</td>
<td>Continuous Reinforced Concrete Structures</td>
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<td>Continuous Slab-Beam-Girder And Concrete Joist Floor Systems</td>
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<td>6</td>
<td>Monolithic Beam-to-Column Joints</td>
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<td>7</td>
<td>Cantilever Retaining Walls</td>
<td>Handouts</td>
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<td>8</td>
<td>Length Effects on Column</td>
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<td>9</td>
<td>Design of Two-Way Floor Systems Yield Line Theory of Slabs</td>
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<td>11</td>
<td>Introduction to Prestressed Concrete</td>
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<td>12</td>
<td>Seismic Design of Concrete Structures</td>
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CE 4433 - Behavior and Design of Masonry Structures

Catalog Description: CE 4433 – Masonry materials, structural behavior of masonry assemblages, deformational characteristics of brick, block, and natural stone masonry. Performance of load-bearing wall systems, design of unreinforced and reinforced masonry members including beams, columns and pilasters, and walls; special design and construction topics; application of design to low and high-rise masonry buildings

Prerequisite by topic: CE 3411, CE 3412

Text Book:

"Building Code Requirements for Masonry Structures (ACI 530-08/ASCE 5-08/ TMS 402-08) and Specification for Masonry Structures (ACI 530.1-05/ ASCE 6-05/ TMS 602-05).

Program Objectives (PO)
1. An ability to design a system, component, or process to meet desired needs, “c.”
2. An ability to identify, formulate, and solve engineering problems, “e.”
3. Use the techniques, skills, and modern engineering tools necessary for engineering practice, “k.”

Course Learning Objectives (CLO):
1. To enable students and Civil Engineers to comprehend the fundamental principles of masonry behavior and to apply them in the analysis and design of masonry structures.
2. To provide the students with an understanding of the mechanics and methods to design masonry elements subjected to various load effects including bending, shear, and axial.
3. To apply material from previous classes including Mechanics of Solids and Structural Analysis
4. To understand the design process in general and in specific as applied to Masonry structures.
5. To analyze and design reinforced and unreinforced masonry beam and lintels for various load effects including flexure, axial, and shear.
6. To analyze and design reinforced and unreinforced masonry walls under out-of-plane bending and axial load.
7. To design masonry column and masonry pilaster for various load effects including flexure, axial, and shear.
8. To develop shear walls.
9. To detail masonry elements to meet construction requirements.
10. To develop engineering judgment to design safe and efficient structures.
Course Topics

1. Review of the design process and design method (CLO 1, 2; PO c, e, k)
2. Introduction to masonry and masonry materials (CLO 1, 2, 3, 4; PO c, e, k)
3. Design for flexure, working stress and strength design (CLO 1, 2, 3, 4, 5; PO c, e, k)
4. Design for flexure and shear with reinforcement (CLO 1, 2, 3, 4, 5, 6; PO c, e, k)
5. Design for flexure and axial load (CLO 1, 2, 3, 4, 5, 6, 7; PO c, e, k)
6. Load distribution on shear walls (CLO 1, 2, 3, 4, 5, 6, 7; PO c, e, k)
7. Design of shear walls (CLO 1, 2, 3, 4, 5, 6, 7, 8; PO c, e, k)
CE 4531 - Life Cycle Analysis and Carbon Footprinting

Course Description: Life Cycle Analysis examines the environmental impacts of products, processes and policies beyond their direct production. Cradle to grave analysis in this manner provides the full picture are needed to understand the true impact. This course provides an overview of Life Cycle Assessment principles and practice in relation to environmental and energy concerns. Regulatory and economic decision support tools and software analysis packages will be included. The course is structured such that students will start an LCA from the beginning of the course and progress on it as topics are covered.

Textbook: The Hitchhiker’s Guide to LCA, by Baumann and Tillman, 2004 Supplemented with lecture notes, handouts and material posted on blackboard

Prerequisites: Physics I, Calculus I

Course Learning Objectives:
1. Develop an understanding of the concept of LCA, regulatory basis and documentation needs.
2. Establish the use of software based inventory assessment tools.
3. Understand the main characteristics, applications and limitations of LCA.
4. Recognize the applicability of different types of LCA to specific situations.
5. Learn about the economic and societal impacts of these analyses.

Topics Covered
1. The Fundamentals of LCA, its history, four stages and regulatory basis will be discussed. ISO14040 will be utilized as the framework for this discussion.
2. The major types of LCA and their specific applications and limitations based on
3. Methods and calculations involved in the Inventory Analysis phase of LCA will expose students to mass and material balancing. This will include the quantification of energy and environmental emissions.
4. Data sources for LCA will be discussed. The reliability of data, public databases and methods for dealing with incomplete or non-existent data will be addressed.
5. Software based analysis to perform LCA will be utilized throughout the course. Students will download free LCA software to their personal computers to conduct projects based on lectures.
6. The simplified/proposed Streamlined LCA process will be discussed.
7. Several Case Studies of LCA performance and results will be examined to highlight the power and at times, unexpected results that LCA can provide.
8. The final stages of LCA (Impact Assessment and Interpretation of Results) will allow students to utilize study results for informed decision making.
CE 4621 - Engineering Hydrology

Course Description

Quantifying water flow in watersheds is a crucial step in the design of environmental facilities, such as drinking water treatment plants and in delineating floodplains. This course deals with the water cycle over watersheds by addressing the motion of water masses in the atmosphere and in surface and subsurface systems.

Students who successfully pass this class should be able to deal with most hydrology problems treated in the industry sector.

Prerequisite: ENGRG 3553 Fluid mechanics, Math 2043 Calculus III

Text


Additional textbooks


“Hydraulique generale et appliquee”, Editor is Eyrolle, by Carlier, M., 1972.

Classes

Held weekly on Thursday 4:40 PM-7:30-PM in Room 518 E&A. Attendance is expected. Students may leave after 15 minutes if the instructor or a substitute has not arrived by that time.

ABET Program Outcomes A, B, E, H, J, K

PROPOSED TOPICS in chronological order

Topic 2 Evaporation, Evapotranspiration, Precipitation, point and radar measurement, IDF (p1-p54) [a,h,j]
Topic 3 Rainfall losses, infiltration, effective rainfall. baseflow separation. (p55-p70)[a,b]
Topic 4 Unit hydrograph, convolution, S-method, deconvolution, HEC-HMS (p97-p127) [a,b,e,k].
Topic 5 Watershed morphology. Synthetic unit hydrographs. Rational, Snyder, Epsey, and SCS methods. (p128-p150), [a,b,c,d,k].

Mid-term exam

Topic 6 Hydrologic Routing, Reservoir model, Muskingum. (p241-p270) [a,b,e]
Topic 7 Hydraulic Routing: Kinematic Wave. (p271-p311) [a,b,e,k]
Topic 8 Delineation of floodplains. GIS usage, (p633-651)[a,b,e,j,k]
Topic 9  Groundwater flow. Dupuit assumption. Hydraulics of Wells. (p500-564) [a,b,h,j]
Topic 10  Unsaturated flow. Green and Ampt equation. (p70-80+ handout)[a,j]

Letters in brackets indicate the Course Learning Objectives for ABET purpose.
CE 4631 - Environmental Hydrology

Technical Elective

DESCRIPTION: CE 4631 Environmental Hydrology
A student of the physical laws affecting the occurrence, distribution, movement, storage, and contamination of water in watersheds. The physics of surface and subsurface circulation and storage of water and the transport of contaminants in watersheds, soils, aquifers, rivers, the ocean, and the atmosphere. The laws and equations which govern the recharge, flow, storage, and discharge of water in natural environments. The laws and equations governing the occurrence, adsorption, propagation and fate of contaminants in natural environments. Hydrologic effects of global climate change. Engineering methods for the sustainable use of water resources.


CLO: To prepare the engineer in the fundamentals of hydrologic and hydraulic analysis and its application to engineering design, and environmental engineering (ABET category a, b, and k).

PREREQUISITES: MATH 3041 Differential Equations or equivalent

TOPICS: 1. The hydrologic cycle (PO a, b, k)
2. Precipitation (PO a, b, k)
3. Evaporation and Transpiration (PO a, b, k)
4. Infiltration and recharge (PO a, b, k)
5. Groundwater (PO a, b, k)
6. Surface runoff and streamflow (PO a, b, k)
7. The hydrology of extreme events (PO a, b, k)
8. Hydrological aspects of water quality (PO a, b, k)
9. The hydrology of river pollution (PO a, b, k)
10. The hydrology of river pollution (PO a, b, k)
11. Soil and groundwater of lake pollution (PO a, b, k)
12. Water Distribution Systems, Hydraulic transients (PO a, b, k)
13. Pipe networks, reservoir, and rainfall analysis and detention basin design for flood control (PO a, b, k)
14. Stormwater control, sewers and detention, Highway drainage and culverts (PO a, b, k)
15. Hydraulic structures (PO a, b, k)
CE 4641 - Urban Streams and Stormwater Management

Course Description: Stormwater management has become a significant issue in recent years. In the past, the typical thinking was ‘get it out of my town’ which resulted in downstream communities suffering the brunt of poor or inadequate management. In fact, only the rate of runoff was addressed, not the volume, nor the quality of that runoff. In urban areas, the volume of runoff increases significantly due to the additional impervious cover (e.g. pavement and rooftops) and urban stormwater runoff causes water quality degradation due to excess amounts of nutrients, metals, bacteria and sediment. This course will address the impacts of improperly controlled runoff on urban streams and how the rate, volume and quality of urban stormwater runoff can be properly controlled through appropriate Best Management Practice (BMP) implementation.

3 credit hours

Prerequisite(s): CE3711 and either CE4621 or CE4631 OR permission of instructor

Required Course Text(s):
  Hardback copy (which includes software) can be purchased online.
  (digital copy avail. for free download)
  Current version avail. at: [www.elibrary.dep.state.pa.us/dsweb/View/Collection-8300](http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8300)
  (digital copy avail. for free download)
- Various journals and articles

Course Learning Outcomes (CLO):
Upon completion of this course students will:
1. Have a basic understanding of the fundamental relationships which govern stream channel characteristics (po a)
2. Have a basic understanding of how urbanization affects stream function (po a)
3. Have a basic understanding of the proper management of stormwater through the design and implementation of various structural and non-structural best management practices. (po c, k)

Program Outcomes (PO): a, c, k

Course topics:
1. Stream Hydraulics and Morphology (CLO1)
2. Regulations and Policy (CLO2)
3. The Runoff Process (CLO1,2)  
4. Stormwater Management Principles (CLO2, 3)  
5. Erosion and Sedimentation (CLO2)  
6. Unit Processes in SW Management (CLO3)  
7. BMP Design (CLO3)  
8. SW Quality and Quantity Modeling (CLO3)  

**Schedule:** The course meets for Lecture three hours per week for the semester. Weekly sessions consist of 1 150-minute class. There is no Laboratory session.

**Student Evaluation:**  
- Attendance and Participation 10%  
- Homework 30%  
- Mid-term Exam 30%  
- Final Exam/Project 30%  

*Academic honesty, in all of its forms, is expected at all times.* Plagiarism, cheating, copying and other forms of dishonesty will not be tolerated and will result in a score of 0 for the assignment in question for all parties involved. A second instance of dishonesty will result in an F for the course for all parties involved. Additional information may be found in the Undergraduate Bulletin.

**Disability Accommodation:** Any student who has a need for accommodation based on the impact of a disability should contact me privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at 215-204-1280 in 100Ritter Annex to coordinate reasonable accommodations for students with documented disabilities.

**Instructors:** Robert J. Ryan, Ph.D., P.E.  
Domenic Rocco, M.C.E., P.E.
CE 4711 - Air Pollution Control Systems

Course Description: Principles of design and operation of the major categories of air pollution control equipment. Theory and principles are presented to reinforce extensive application and design components. 3 credit hours

Prerequisite(s): ENGRG 3553 Mechanics of Fluids and Physics 1062

Text: Cooper, C. David and Alley, F.C., 2002 *Air Pollution Control: A Design Approach, 3rd ed.*

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<th>Homework</th>
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<td>Ch 1, 2, 9</td>
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<tr>
<td>Particulate Matter, Cyclone, Project Parts 1 and 2</td>
<td>Ch 3, 4, 9</td>
<td>1.5, 1.21, 2.1, 2.9</td>
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<td>Cyclone, Electrostatic Precipitators, Project Parts 4 and 6</td>
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<td>ESP, Fabric Filters, Project Part 5</td>
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<td>4.1, 4.5, 4.13 (2000 $)</td>
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<td><strong>Final Exam</strong></td>
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CE 4721 - Water and Wastewater System Design

Course Description: Unit operations in water treatment, design objectives and parameters of water treatment; coagulation and flocculation; filtration plant design; physical unit operations; biological unit processes; design of facilities for biological treatment of wastewater.

Prerequisite: CE 3611 Hydrology and Hydraulic Engineering


Course Objectives: Students are expected to apply engineering design principles to the challenge of providing drinking water and wastewater treatment for communities. Specific objectives include:

- Interpret the results of laboratory analyses of water and wastewater samples;
- Obtain and analyze data for the planning and design of water and wastewater treatment systems;
- Apply reaction kinetics and material balances to the design and analysis of treatment processes and systems;
- Apply design criteria for the sizing of treatment processes, water distribution systems and wastewater collection systems;
- Integrate unit processes into a complete water and wastewater treatment system to meet specified objectives;
- Investigate innovative or alternative treatment processes and compare to conventional processes.

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<th>Topic</th>
<th>Text Chap. and other reading</th>
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<td>Ch 1, 2, PADEP Wastewater Manual, PADEP Water Supply Manual, Ch3 (p20-29; 36-42), Ch 4 (p73-89), Ch 5</td>
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<td>Jan-24</td>
<td>Tue Th</td>
<td>Population Projection; Sustainability: Source Water Assessment</td>
<td>Ch 4-5, ASCE Sustainability, Sustainable Dev Article, MCL Handouts</td>
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<td>Exam 3</td>
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CE 4731 - Solid & Hazardous Waste Engineering

Catalog Description: Solid & Hazardous Waste Engineering (3 s.h.)
Covers solid waste engineering principles designed to address the growing and increasingly intricate problem of controlling and processing the refuse (solid waste) created by urban societies. Situations dealing with real world settings are covered through worked examples and field trips to solid waste management facilities.

Prerequisite by topic: ENGR 0001, CHEM C071. Junior Standing.


Course Learning Objectives:

1. Solid and hazardous waste engineering are multidisciplinary undertakings, requiring inputs from practitioners in many fields working in teams, including engineers, geohydrologists, microbiologists, and soil scientists. The course will therefore build upon previous training while developing an appreciation for other scientific and nontechnical disciplines. Consequently, the course will prepare students to work in the complex, inter-disciplinary fields of solid and hazardous waste engineering (PO A).

2. Practitioners in the field of civil engineering must recognize and deal with interrelated water pollution, air pollution, solid waste, and groundwater issues that affect the environment and human health. The course will therefore introduce students to the multi-media nature of solid and hazardous waste engineering (PO A).

3. To provide sufficient exposure to fundamental engineering principles and current practices that the student will have the tools to confront various scenarios. Each hazardous waste management project provides a different set of circumstances. Consequently, the course is designed to provide students with sufficient skills and background in the art and science of solid and hazardous engineering to allow them to begin to think about how to approach solid and hazardous waste problems rather than providing simple "cookbook" solutions (PO A,E,F,H,I,J).
Program Outcomes: a, e, f, h, i, j

Course Topics:

1. DEFINITIONS & SOURCES CHARACTERIZATION (CLO 1,2)
2. SOLID WASTE CHARACTERIZATION (CLO 1,2)
3. REDUCTION, REUSE, RECOVERY, AND RECYCLING (R^4) OF SOLID WASTES (CLO 1,2,3)
4. WASTE SEPARATION AT THE SOURCE REFUSE- DERIVED FUEL (RDF) (CLO 1,2)
5. INCINERATION/PYROLYSIS (CLO 1)
6. SOLID WASTE LANDFILLING INCLUDING (CLO 1,2):
   a. Siting;
   b. Design;
   c. Cap and Liner Stability Analysis;
   d. Leachate Piping Stress Analysis;
   e. Clay and synthetic liners; etc.
7. COMPOSTING (CLO 1,3)
8. FIELD TRIP(S) (CLO 1,2,3)
9. BENEFICIAL UTILIZATION OF SOLID WASTES (CLO 1,2,3)
   a. Biosolids;
   b. MSWC Byproducts;
   c. Coal Combustion Byproducts;
   d. Composts;
   e. Others

Computer Usage: Not required but useful for problem sets

Instructor: David M. Kargbo, PhD, Associate Professor of Civil & Environmental Engineering

Prepared by: David M. Kargbo

Date: February 14, 2005
EE 2112 - Electric Devices & Systems I

Fall 2010

Catalog Data: The purpose of this course is to teach non-Electrical Engineering major students the basics of Electrical circuits and systems, such as: voltage and current, electrical elements (resistors, inductors, capacitors), Kirchoff current and voltage Laws, parallel and series connections, time domain vs. frequency domain analysis, AC power, three phase systems, electrical machines, operational amplifiers, semiconductor diodes and transistors.

Instructor: Mr. Frank Ferrese, Adjunct Professor


Prerequisite: Physics1061

Co-requisite: EE2113, Electrical Devices and Systems I Laboratory (optional)

Course Learning Objectives (CLO):

1. Understand fundamentals of charge, energy, and power as it relates to electric circuits (PO A, K)
2. Understand Kirchoff Current and Voltage Laws, and methods of network analysis (PO A, K)
3. Understand phasors, AC circuit analysis, power and reactive power (PO A, K)
4. Analysis of operational amplifier based circuits (PO A, K)
5. Understand semiconductor diodes and transistors (PO A, K)
6. Understand of basic digital logic circuits (PO A, K)
7. Understand principles of electromechanics and electric machines (PO A, K)

Course Topics:

1. Charge, power and energy in electrical circuits (CLO 1)
2. Analysis of resistive circuits (CLO 2)
3. Analysis of AC circuits with dynamic devices (CLO 2,3)
4. Operational Amplifiers (CLO 4)
5. Semiconductors and Diodes (CLO 5)
6. Bipolar Junction Transistors (CLO 5)
7. Digital Logic Circuits (CLO 6)
8. Electromechanics (CLO 7)
9. Electrical Machines (CLO 7)
ENGR 1101 - Introduction to Engineering and Engineering Technology
ENGR 1901 Honors Introduction to Engineering

Required Course

Course description: Introduction to Engineering and Technology (2 s.h.)
Provides an understanding of the study and practice associated with civil, electrical and mechanical engineering and technology disciplines. Understand the importance of good communications and teamwork skills in a successful engineering and technology career. Understand the basics of problem solving and design. Discipline-specific labs.

Course Prerequisites/Restrictive Statements
This course is open only to students in the College of Engineering. All first-year students (including Transfers without an approved equivalent course) must take this course in the first or second semester of attendance. Exceptions must be approved by the Director of Undergraduate Studies.


Laboratory: ENGR 1101 Laboratory Manual
Penny Vehicle Design Competition (*Identifying the Critical Design Issue*)
MATLAB, MS PowerPoint
Energy Lab (*Spring Design and Analysis*)
Mechanics Lab (*Simple Statics*)
Electronics Lab (*Basic Circuit Analysis*)
Electro-Mechanics Lab (*Integrated Design, Robotics*)
**Additional for ENGR 1901:** Team-based product Design and Construction

ABET Program Outcomes: B, D, I

Course Learning Outcomes (CLO)
1. describe specifics of the various engineering disciplines and careers in engineering (PO I),
2. identify and locate resources and opportunities on campus that assist in achieving unique educational goals (PO I),
3. work in teams to solve engineering problems (PO D),
4. apply a structured design process by developing and analyzing working models of basic engineering systems (PO B).

Course Topics
1. Engineering Disciplines [CLO 1]
2. Engineering Systems [CLO 4]
3. Problem Solving [CLO 4]
5. Data Analysis [CLO 4]
7. Electronics [CLO 4]
8. Penny Vehicle Competition [CLO 3, 4]
9. Matlab Laboratory [CLO 3, 4]
10. Energy Laboratory [CLO 3, 4]
11. Electro-Mechanics Laboratory [CLO 3, 4]
12. Mechanics Laboratory [CLO 3, 4]
13. Student Chapter presentations [CLO 2]
14. Time Management [CLO 2]
15. Networking & Professional Societies [CLO 1, 2]
16. Ethics & Professional Practice [CLO 1]
17. Dr. Marie Amey-Taylor: Meyers-Briggs Type Inventory [CLO 1]

Class and Laboratory Schedule
Lecture: 1.5 semester hours, 75 minutes per week, 14 weeks per semester
Laboratory: 1.5 semester hours, 75 minutes per week, 14 weeks per semester
ENGR 1901: Same Lectures, Laboratory scheduled separately

Contribution to Meeting Criterion 5 Requirements

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<td>Humanities/Social Sciences</td>
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<td>Basic Engineering</td>
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<td>Professional Level Engineering (Design)</td>
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Prepared by William C. Miller, PhD, PE
August 2010
ENGR 1117 - Engineering Graphics

Required in CE & ME

Catalog Data: This course is designed to gain proficiency in understanding and creating engineering drawings as well as to formulate and solve engineering design problems. The use of AutoCAD as a means to accomplish the above set objectives will also be explored in detailed.

Prerequisite: Plain geometry and trigonometry

Textbook: AutoCAD 2010 in 2D and 3D: A Modern Perspective
Authors: Paul F. Richard, Frank Puerta and Jim Fitzgerald
ISBN -10: 0135079314

Course Learning Outcomes (CLO):

1. Gain proficiency at creating engineering drawings (PO, K)
2. Formulate and solve an engineering design problem
3. Create a portfolio of the design problem (PO, C)
4. Self evaluation on competence in engineering graphics

Program Outcomes (PO): C, K

Course Topics:

1. Hand sketching - Orthographic views
2. Hand sketching - Isometric views
3. Introduction to CAD & Basic construction technique
4. Basic editing & plotting technique
5. Geometric Construction
6. Template Drawings
7. 2D orthographic drawing
8. Dimensioning
9. Using Blocks and customizing toolbars
10. Introduction to solid modeling
11. Changing and plotting solid models
12. Creating assembly from solid models
13. Rendering

**Schedule:** The course meets for lecture three hours per week for the semester. Weekly sessions may consist of three 50-minute classes, two 80-minute classes, or one 150-minute evening class. There is no laboratory session.

**Student Evaluation:** Weekly Assignments/Quizzes 30% Project 30% Mid-term Exam 20% Final Exam 20%

**Accessibility:**

Any student who has a need for accommodation based on the impact of a disability should contact me privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at 215-204-1280 in 100 Ritter Annex to coordinate reasonable accommodations for students with documented disabilities.

**Academic Integrity:** This course is conducted under the policies and procedures concerning Academic Honesty as published in the Undergraduate Handbook.

**Coordinator:** Srikanth Bontha, Ph.D.

**Date:** 04/18/2010
ENGR 2196 - Technical Communication

Required in CE, EE and ME.

Prerequisites: MATH 1041 and MATH 1042: Calculus I & II, GenEd: Analytical Reading & Writing, Physics 1061 Sophomore Standing in Electrical or Mechanical Engineering

Course Description: This course introduces technical writing skills and related techniques used by electrical and mechanical engineering practitioners. Assignments focus on engineering documents that junior engineers might be called upon to write, e.g., technical literature summaries, analytic memos and reports, user procedural instructions, and research project proposals.

Course Learning Objectives (CLO):

Successful completion of the course will substantially advance students’:

1. Ability to communicate effectively (PO – G)

Additionally, the course modestly advances other POs:

1. Ability to design and conduct experiments, as well as to analyze and interpret data (PO – B)
2. Ability to function on multidisciplinary teams (PO – D)
3. Understanding of professional and ethical responsibility (PO – F)
4. Understanding of the impact of engineering solutions in a global economic, environmental, and societal context (PO – H)
5. Recognition of the need for, and an ability to engage in, life-long learning (PO – I)
6. Knowledge of contemporary issues (PO – J)

Topics:

1. Adopting a technical communicator’s mindset (CLO – 1, 4, 6)
2. Organizing a technical writing project efficiently and fairly (CLO – 1, 3)
3. Finding, evaluating, and using research sources (CLO – 1, 2, 4, 7)
4. Orienting technical communication to audience-stakeholder needs and interests (CLO – 1, 4, 5)
5. Refining and pursuing communication objectives (CLO – 1, 5)
6. Composing readable and understandable narrative text (CLO – 1)
7. Designing information for improved usability (CLO – 1, 5)
8. Developing, checking, and accurately communicating factual-statistical claims (CLO – 1, 2, 4, 5, 7)
9. Crafting and critiquing logical technical arguments (CLO – 1, 2)
10. Improving ethics in technical communication (CLO – 1, 4, 5, 7)

Textbooks:

4. *Technical Writing: Quality, Efficiency, Responsibility* – instructor’s course handbook (PDF, updated each semester)

Joe Danowsky  Fall 2010
ENGR 2331 - Engineering Statics
Temple University College of Engineering   Spring 2011

Course: ENGR 2331/0131, Section 002, Engineering Statics
Schedule: M W F, 1:00 PM – 1:50 PM, Classroom: CEA 617
   Wednesday, 12:00-12:50 PM, Classroom: CEA 309
Instructor: Dr. Jim S. Chen   Office: 607B
Email: jsjchen@temple.edu  Phone: (215) 204-4305

Office Hours: M & W 11:00-11:50 a.m., T 1:00-1:50 p.m. or by appointment
Prerequisites: Math 1041/C085 – Calculus I & Physics 1061/C087 – Physics I
Co-requisite: Math 1042/C086 – Calculus II
TA: Jing Bao  email: tuc09949@temple.edu
Peer Teacher: Alani Intintolo: tub52619@temple.edu

COURSE LEARNING OBJECTIVES (CLO):
8. Utilize Free-body Diagrams to apply concepts of equilibrium to particles or rigid bodies. (PO A)
9. Analyze forces and moments in two and three dimensions, using calculus and vector analysis. (PO A, E, n)
10. Utilize concepts of centroids and moments of inertia (PO n)
11. Analyze structures including trusses, frames and machines (PO A, E, n)
12. Understand friction and its application (A, E, n)

Course Topics:
1. Introduction to mechanics, Newton’s laws, scalars and vectors, units, and problem solving.
2. 2-D & 3-D force system, rectangular components, moment and couple resultants (CLO 1, 2)
3. Equilibrium in 2-D & 3-D; free-body diagrams; equilibrium conditions (CLO 1,2)
4. Plane trusses; method of joints; method of sections (CLO 1,2)
5. Frames and machines (CLO 1,2)
6. Distributed forces (CLO 2)
7. Centers of mass and centroids of composite and non-composite sections (CLO 3)
8. Friction (CLO 1,2)
9. Area moment of inertia and product moment of inertia (CLO 3)

Grading:
Exam 1 & Exam 2  50%  Closed books & notes, one summary sheet allowed.
Final exam  35%  Wednesday, May 11, 10:30AM – 12:30 PM.
Homework & Pop Quizzes  15%  Homework problems are due every Wednesday.

>95 A; >90 A-; >86 B+; >82 B; >78 B-; >74 C+; >70 C; >65 C-; >60 D+, >55 D, >50 D-, <50 F

Attendance:
Students are expected to attend every class. If you know in advance that you will be unable to make a quiz/exam/homework and have a valid reason, you must contact the instructor or the TA prior to the due date, not after! Coping homework is not acceptable.

Exams, Quizzes and Homework:

1. All exams are close books/notes. One summary sheet and a ‘regular’ calculator will be allowed.
2. TA will collect and review the homework problem for that week. Homework must be neat and clear. No credit for late homework. Homework assignments are due every Wednesday.
3. There will be no make-up exams, quizzes or homework assignments unless you can provide a doctor’s note for medical issues.

Student with Disability:

Any student who has a need for accommodation based on the impact of a disability should contact me privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at 215-204-1280 in 100 Ritter Annex to coordinate reasonable accommodations for students with documented disabilities.

Student and Faculty Academic Rights and Responsibilities Policy:

Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has a policy on Student and Faculty and Academic Rights and Responsibilities (Policy #03.70.02).

Email Policy:
All outside of class communication via e-mail must use a @temple.edu address.

Dr. Jim Chen  Spring 2011
ENGR 2332 - Engineering Dynamics

ENGR 2332 – Dynamics, 3 cr.,

Required in CE and ME

Spring, 2011

Course Description: A vector approach to the study of the rectilinear and curvilinear motion of particles and rigid bodies as described by rectangular, polar, and path coordinates and the study of the forces that produce such motion as described through the application of Newton's second law of motion, work-energy relationships, and impulse and momentum principles, including rigid body rotation and relative motion.

Instructor: Prof. Xiaofeng “Bill” Zhang, PhD, PE, SE, LEED® AP


Course Learning Objectives (CLO):

! Study the rectilinear and curvilinear motions of particles, systems of particles, and rigid bodies. (PO A)
! Utilization of free-body diagrams to model physical systems and to solve problems in dynamics. (PO A)
! Understand and utilize Newton's Laws to solve problems in dynamics. (PO E)
! Understand and utilize work-energy relationships in the solution of dynamics problems. (PO E)
! Understand and utilize the principle of impulse and momentum. (PO E)

Course Outline:

3. Brief review, introduction to dynamics.
7. Plane Kinematics of Rigid Bodies.
8. Plane Kinetics of Rigid Bodies.

Grading:

Homework 10 %
Midterms/Quizzes 50 %
Final Exam 40 %
Temple University Mechanical Engineering Department Course Description

ENGR 2333 - Mechanics of Solids

Catalog Data: ENGR 2333 Mechanics of Solids (3 s.h.). Classical approach to axial stress and strain, torsion, bending, combined stress, biaxial stress, deflection of beams and frames, elastic strain energy, pressure vessels, column stability, and buckling.

Prerequisite: Statics, ENGR 2331 (ENGR 131)

Textbook:

Course Learning Outcomes (CLO):

1. Reinforce the principle of statics.
2. Develop the ability to visualize a problem (in a mechanical system/or structure) and the nature of the quantities being calculated.
3. Develop the ability to analyze a given problem in a simple and logical manner and to apply to its solution a few fundamental and well-understood principles.
4. Reinforce the principal of equilibrium.
5. Introduce basic concepts regarding internal forces, deformation, and the relationships between them, i.e. stress-strain relationship.
6. Perform analysis of stresses and their corresponding deformation in various structural members/or machine components, considering axial loading, torsion, pure bending, buckling, combined loading, and transverse loading.
7. Introduce the basic concept in solving a statically indeterminate structural member/or mechanical member under axial and torsional loading.
8. Determine the state of stresses on an arbitrary plane and their effect on the material.
9. Determine the load carrying capacity of structural members and design them.
10. Answer the mechanics of solids questions on the FE exam.
Program Outcomes (PO): A, E, n

Course Topics:

1. Review of Statics
2. Introduction – Concept of Stress
3. Stress and Strain – Axial Loading Deformations
4. Torsion
5. Pure Bending
6. Analysis and Design of Beams for Bending
7. Shearing Stresses in Beams and Thin-walled members
8. Transformation of Stress and Strain
9. Principal Stresses under a Given Loading
10. Deflection of Beams
11. Columns
12. Energy Method

Schedule: The course meets for lecture 200 minutes per week for the semester. Weekly sessions may consist of three 50-minute classes, and one 50-minute recitation class. There is no laboratory session.

Prepared By: Srikanth Bontha, Ph.D.
Date: 10/21/2010
ENGR 3096 - Economic Analysis

Syllabus
Economic Analysis ENGR3096
Required in ME; Elective in CE
Instructor: Dr. Fernando Tovia | e-mail: toviaf@temple.edu Spring 2011

Textbook

Course communications: Blackboard http://www.temple.edu/cs/students/blackboard.htm

Prerequisites:
Junior standing

Course Description:
This course is designed to provide the engineering student with the decision making skills necessary to evaluate the economic feasibility of investment projects. As the capital outlays may be significant and affect the productive potential of a firm over the long term, it is important to understand the time value of money. The course emphasizes on measurements of economic worth, after tax cash flow analysis, replacement analysis, and supplemental analysis; including break even, sensitivity, and risk analysis. A final project consisting of evaluating a real world investment project is performed and presented at the end of the course.

Course Learning Objectives (CLO)
Successful completion of the course will enable students to:
1. Identify, formulate, analyze, and solve engineering economic problems (PO E)
2. Communicate effectively (PO G)
3. Recognition of the need for, and the ability to engage in life-long learning (PO I)

Schedule
Section 1  T  5:30 – 8:00 p.m.
Section 2  M  5:30 – 8:00 p.m.
Office hours  M - T  4:00 – 5:30 p.m or r by appointment.

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<td>Sensitivity and break even analysis</td>
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<td>Risk analysis and Monte Carlo Simulation</td>
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### Grading

**Homework Assignments (15%)**
A weekly assignment will be given at the end of each lecture, and it will be due at the beginning of the next lecture. No late assignment will be accepted unless it is authorized in advance by the instructor.

**Quizzes (15%)**
There will be 7 short quizzes given during the semester. The short quizzes will consist of FE type questions, and are intended to prepare the students for the Engineering Economic section of the FE exam. The instructor will post FE type questions that will allow the students to prepare for the quizzes and subsequently for the FE exam.

**Exams (50%)**
There will be 4 tests (including the final exam) given during the semester. The final exam will be cumulative and could be used to drop the lowest test score.

**Final Project (20%)**
The final project is a team project of three students and consists of performing an economic feasibility analysis of a real life investment. Students need to identify an investment project that they would like to analyze. The final project needs to be a written report in a professional format as if it will be presented to a company, and as such it is considered a written intensive project. Guidelines of the project will be given to the students at the beginning of the semester.
ENGR 3496 - Materials Science for Engineers

Required for ME and CE

Catalog Data: Atomic and molecular structures, bonding and interatomic forces, thermodynamics and kinetics of solid-state reactions, mechanical and electronic properties. Research project with written reports.

Prerequisite:
Physics 1062 or 1021; ENGR 2333 Mechanics of Solids; Chemistry 1031, Junior standing.

Textbook:

Course Learning Outcomes (CLO):
Understand the relationship between a material’s structure properties and end use. (PO, A).
Understand the micro-structural differences between classes of engineering materials. (PO, A)
Understand process variables and service conditions that affect property-structure relationships. (PO, A)
Understand the thermodynamics of alloy systems and perform qualitative and quantitative assessments of phase diagrams. (PO’s, A, N)
Understand the kinetics of material transformations and be able to calculate temperatures, rates and energies associated with the transformations. (PO’s A, N)
Understand the mechanical and physical tests that measure material properties and the methods to calculate their values from the tests. (PO’s A, N)
Write a well-organized technical report which demonstrates the ability to research, synthesize and integrate information in a logical, persuasive manner (PO, G).

Program Outcomes (PO): A, G, n

Course Topics:
Electronic structure of atoms.
Atomic bonding and interatomic forces. Ionic, covalent and metallic bonds.
Crystallography. Ideal structures.
Real solids and imperfections in solids. Point, line and planar defects.
Thermodynamics and equilibrium. Phase diagrams and multi-component systems.
Kinetics, reaction rates and diffusion.
Response of materials to mechanical loads. Stress-strain relationships. Deformation and fracture.
Electronic Materials.
Research Reports.

Schedule: The course meets for lecture two and half hours per week for the semester.
Weekly sessions consist of three 50-minute classes. There is no laboratory session.
Student Evaluation: Quizzes 25%, Mid-term 10%, Final 15%, Writing Assignments 50%
Accessibility:
Any student who has a need for accommodation based on the impact of a disability should contact me privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at 215-204-1280 in 100 Ritter Annex to coordinate reasonable accommodations for students with documented disabilities.

Prepared by: Srikanth Bontha, Ph.D.
Date: 10/21/2010
ENGR 3553 - Mechanics of Fluids

ENGR 3553   MECHANICS OF FLUIDS   SPRING 2011

Instructor:  Dr. J. S-J. Chen, Rm 607B, CEA Building
            Email: jsichen@temple.edu, Tel: 215-204-4305
Meeting Schedule:  M, W, F 10:00-10:50 a.m., CEA 316
Office Hours:  M & W 11:00-11:50 a.m., T 1:00-1:50 p.m. or by appointment
Prerequisites:  Differential Equations, Engineering Dynamics, Mechanics of Solids

Successful completion of the course will enable the students to:

1. Understand the properties and fundamentals of fluids and fluid mechanics (PO E).
2. Apply the conservation laws of mass, momentum and energy for flow analysis (PO m)
3. Apply Bernoulli’s and Euler’s equations to solve inviscid flow problems (PO m)
4. Gain an understanding of Reynolds number, friction loss as well as lift and drag (PO I)
5. Develop analytical and numerical skills to design practical fluid flow systems (PO E, G, m)

Course Topics:

1. Fundamental Concepts of Fluids  (CLO 1)
2. Fluid Statics and Pressure Measurements  (CLO 1)
3. The Bernoulli Equation and Applications (CLO 1,2,3,5)
4. Fluid Kinematics and Reynolds Transport Theorem (CLO 1,2,3)
5. Conservation of Mass, Momentum and Energy for Control Volume (CLO 2,5)
6. Euler’s and Navier Stokes Equations (CLO 2,3)
7. Similitude, Dimensional Analysis, and Modeling; Reynolds number (CLO 1,2,3,4)
8. Friction Loss in Pipes and Ducts, Flow Measurements (CLO 2,4,5)
9. Boundary Layer Theory, Drag and Lift (CLO 2,4,5)
10. Open Channel Flow (CLO 1,4)

Note:  Students must take the Fluids Lab: ME 3506 concurrently.
      A pretest based on prerequisites will be given on Monday, January 24.
      One summary sheet (8.5”x11”) along with a calculator is allowed during each exam.

ENGR 3553: MECHANICS OF FLUIDS                  SPRING 2011

TOPICS

CH. 1: Introduction: Definition and Scope, Dimensions and Units
       Fundamental Concepts, Properties and Classification of Fluids

PROBLEMS

CH. 1:  Introduction: Definition and Scope, Dimensions and Units  3, 15, 29, 65, 103
CH. 2:  Fluid Statics: Basic Equations, Pressure Measurements
       Hydrostatic Forces on Submerged Plane and Curved Surfaces
       Buoyancy and Stability

CH. 3:  The Bernoulli Equation: Newton’s 2nd Law,
       Static, Stagnation, Dynamic and Total Pressures,
       Bernoulli Equation and Applications

H.W.

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       Fundamental Concepts, Properties and Classification of Fluids

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H.W.
Week #6: EXAM #1 (one hour, open book and a-page summary)
CH. 4: Fluid Kinematics: Velocity and Acceleration Fields, System and Control Volume, Reynolds Transport Theorem
   2, 9, 17, 21, 37
CH. 5: Finite Control Volume Analysis:
   Conservation of Mass, Momentum and Energy
   3, 8, 24, 29, 36, 46, 52, 65, 92, 97
CH. 6 Differential Analysis of Conservation Laws:
   Continuity Equations, Conservation of Momentum, Inviscid Flow,
   Euler’s Equation and Potential Flows, Viscous Flow and
   Navier Stokes Equation for Newtonian Fluid
   2, 5, 26, 33, 39

Week #12 EXAM #2 (one hour, open book and a-page summary)
CH. 7: Dimensional Analysis and Similitude
   Dimensional Analysis, Buckingham Pi Theorem,
   Flow Similarity and Model Studies
   2, 11, 19, 52, 61
CH. 8: Friction Loss in Pipes and Ducts
   Laminar and Turbulent Flows,
   Friction Losses, flow Measurements
   2, 12, 16, 26, 32, 43, 62, 77, 91, 112
CH. 9: Flow over Immersed Bodies
   Boundary Layer Theory, Drag and Lift, Terminal Velocities
   2, 19, 29, 37, 45, 56, 59, 61, 87, 108
CH. 10: Open Channel Flow
   Surface Waves, Froude Number, Manning Correlation
   2, 10, 19, 28, 37

Homework problems are due on Fridays.

Week #15 Final Exam: Friday, May 6, 8:00-10:00 AM
ENGR 3571 - Thermodynamics

Required in CE and ME.


PREREQUISITES: Chemistry I, Physics I & II, Calculus through integration


COURSE LEARNING OUTCOMES (CLO):
1. Identify and classify thermodynamic systems and problems
2. Obtain and manipulate chemical and thermodynamic properties of solids, liquids & gases (PO A, n)
3. Apply properties of matter to solve problems of energy and entropy balance in both closed and open systems (PO C)
4. Apply principles of energy and entropy balance to analyze mechanical power and refrigeration systems (PO C)
5. Apply thermodynamic principles to an elementary group design project, which addresses societal needs and contemporary issues, having a written or oral report. (PO C, G, H)
6. Answer thermodynamics questions on the FE exam (PO C)

COURSE TOPICS:
1. Properties of a substance. (CLO 2, 6)
2. Work and heat interactions, First law of thermodynamics. (CLO 1, 3, 6)
3. Open and Closed Systems. (CLO 1, 3, 6)
4. Second law of thermodynamics, Carnot cycle, Entropy. (CLO 1, 3, 6)
5. Efficiency and Irreversibility. (CLO 1, 2, 3, 4, 6)
6. Introduction to Engine Cycles. (CLO 1, 5, 6)
7. Project (CLO 5)

SCHEDULE:
The course meets for lecture three hours per week. There is no laboratory session.

CONTRIBUTION TO MEETING CURRICULUM:
Course provides background in energy conversion for CE, ME and EE majors.

Prepared by Dr. Steven Ridenour, July 2010
ENGR 4169 - Engineering/Professional Seminar

Required Course

Course Description: This seminar course is designed to prepare students for Senior Design and professional practice. The course will 1) direct students in skills to be utilized in senior design, 2) expose students to ethics, professional societies and registration and 3) develop soft skills. At the completion of this course students are expected to have selected a senior design team, advisor and project.

Prerequisite: Senior Standing (within one semester – individual curricula may have additional requirements).

Textbook: None. Handouts will be available through blackboard.

ABET Program Outcomes (PO): F, I, J

Course Learning Objectives (CLO):
1. Convey an understanding of professional and ethical responsibilities in an engineering career. (PO F)
2. Encourage engagement in life-long learning in the profession of engineering. (PO I)
3. Develop students’ job-seeking skills
4. Understand the process involved in and benefits of obtaining professional license and credentials. (PO I)
5. Understand and appreciate the benefits of networking in ones career and in understanding contemporary issues (PO J)
6. Develop skills and concepts that students will utilize throughout their professional careers.

Course Topics:
1. Concept of senior design: goals, process, structure, and teamwork. CLO 6
2. Computer programs used in professional careers. CLO 6
3. Resume writing, interviewing and career services. CLO 3
4. Ethics, professional conduct and contemporary issues. CLO 1, 5
5. Professional registration, lifelong learning and advanced degrees. CLO 2, 4, 6
6. Development of soft skills. CLO 1, 5, 6
7. Preparing websites for project dissemination. CLO 3, 5, 6

Schedule: The course meets for Lecture 1 hour per week for the semester. Weekly sessions consist of 1 50-minute class. There is no Laboratory session.

Student Evaluation:
Attendance and participation 40%
Homework/Other Assignments 60%

Contribution to Meeting Criterion 5 Requirements:

<table>
<thead>
<tr>
<th>Curricular Area</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Basic Science &amp; Math</td>
<td></td>
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<tr>
<td>Humanities/Social Sciences</td>
<td></td>
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<tr>
<td>Basic Engineering</td>
<td>100%</td>
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<tr>
<td>Professional Level Engineering (Design)</td>
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</tbody>
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Prepared by: Robert J. Ryan, Ph.D., P.E.
ENGR 4196/4296 - Senior Design Project I & II

ENGR4196. Senior Design Project I (1 s.h.) F. RCI: WI. $.

Spring 2010

Catalog Data: Team-oriented engineering system design problems of various types. Topics proposed and orally presented by students in the initial stage of the course sequence. At completion, the project is demonstrated during an oral presentation and a final written report. [Required Course for all Engineering students]

Instructor: Dr. Joseph Picone, Professor

Textbook: None required (an extensive online archive of projects is available)

Prerequisites: Senior standing in the student’s department, and completion of 90 s.h.

Class Schedule: The course meets for Lecture one hour per week. T, 50 minutes. Students are also expected to meet as teams a minimum of one hour per week, and to meet with their faculty project advisor(s) at least once per week.

Contribution of the course to meeting the requirement of Criterion 5 (how the course fits into the curriculum): This is the first course in a two-semester capstone design experience. Students conceive and design a complex engineering system, and create a plan for execution of the project in the second semester.

Course Learning Outcomes (CLO):
1. Provide a realistic experience working on a medium-term technical engineering project that embodies the principles of engineering design (e.g., the design cycle). (PO B, C)
2. Participate in a multidisciplinary design experience that includes both technical and practical design constraints. (PO D, F, H, J)
3. Synthesize the knowledge acquired from the preceding three years of the engineering curriculum and in the senior level courses. (PO A, o)
4. Develop the skills necessary to function effectively in a team. (PO D)
5. Demonstrate the ability to communicate (both orally and visually) and defend technical ideas and concepts to team members, faculty advisors and a general technical audience. (PO G)
6. Simulate a professional work experience, including information gathering, scheduling and budgeting. (F, H, J)

Course Topics:
1. The engineering design cycle (CLO 2, 3)
2. The design document (CLO 4, 5)
3. Engineering design constraints (CLO 2)
4. The art of the technical presentation (CLO 4, 5)
5. Project design reviews (CLO 1, 5, 6)
6. Cost and schedule (CLO 6)
7. Simulation, standards and testing (CLO 1, 3)
8. Entrepreneurship and global competitiveness (CLO 1, 6)

Design groups nominally consist of four students. Each group has a faculty advisor and can also have industrial advisors. Through the two semester course, four presentations are required, each made by a different team member. A rigorous design review is conducted at the end of the semester which is open to the entire College (held on Senior Design Day). Students are encouraged to find their topics and teams in a previous course – ENGR 4169: Professional Seminar. Students are expected to enter senior design with a team and an approved topic. Topics may come from any of the following sources:

7. an industrial or engineering company,
8. a university research center or lab (typically within Temple University) or a faculty research lab,
9. a department-sponsored design competition sponsored by a regional or national technical society,
10. a faculty advisor,
11. or through a negotiation with the faculty advisor and student team on a topic of mutual interest.

Students are encouraged to form multidisciplinary teams and participate in college-wide projects.
ABET Compliant Course Description
ENGR 4196/4296 SENIOR DESIGN PROJECT I & II

CATALOG DESCRIPTION:
ENGR 4196/4296 - SENIOR DESIGN PROJECT I & II - Credits 1 & 3. Team oriented engineering system design problems of various types. Topics proposed and presented by students in the initial stage of the course sequence. At completion, the project is demonstrated during an oral presentation. Project results are submitted in a report suitable for entry in national student engineering competitions. This course has been designated as writing intensive for the University Core Curriculum.

PREREQUISITES: Accumulation of 90 credits and Senior Status in the curriculum. Students should have completed ENGR 4169 [360] in the previous semester. Department requirements are as follows:

CE: Student must have completed ENGR 3553 [253] and 5 of the 7 following courses: CE 1105 [005], CE 3411 [211], CE 3331 [231], CE 2341 [241], CE 3311 [344], CE 3441 [262] and CE XXXX (a Civil Engineering elective).

The elective, CE XXXX, and CE 3311 [344] may be taken as co-requisites. All other courses must be completed before taking senior design.

EE: All students must have an overall GPA of 2.0 in the major area of study and have completed the following courses:
ENGR 2196, EE 3312, EE 3412, EE 3522, EE 3612, EE 3712.
Computer Engineering: ENGR 2196, EE 3522, EE 3612, EE 3622, CIS 1068, CIS 2168.

All of the above courses must be completed prior to taking senior design. Exceptions must have the approval of the department chair.

ME: ENGR 2333 [133], ENGR 3553 [253], EE 2112 [063], ENGR 3571 [271], ENGR 3117 [310], ME 3421 [221], ME 3301 [231], ENGL 2696 [W102]

Lead Instructor: Dr. Joseph Picone, Professor, Electrical Engineering,
Dept. Coordinators: Dr. Richard S. Cohen, Professor, Mechanical Engineering
Dr. Frank P. Higgins, Electrical and Computer Engineering
Dr. Rob Ryan, Civil and Environmental Engineering

Course Learning Objectives: The engineering design project sequence is intended to:
1. Provide an experience requiring the synthesis of knowledge gained in the preceding three years of the engineering curricula and in the senior level courses, including economic, social and environmental factors. (PO F, H, J)
2. Stimulate creative and individualized thinking, including the design of systems, and design and perform experiments within one’s major field of study (PO B, C, o)
3. Provide experience working as a member of an engineering team including engineers from several disciplines. (PO D)
4. Simulate a professional work experience. (PO G, H, J)
5. Develop information-gathering skills.
6. Provide practice in communicating ideas by written, graphical, and oral methods. (PO D, G)

7. Provide experience in organizing, scheduling and assigning work to complete a technical project on time and within budget. Some of the projects may involve construction, fabrication and testing, others may use only computers or paper and pencil. Interaction between students of the various engineering disciplines, the faculty, and engineers/scientists of industrial, commercial, and governmental institutions is strongly encouraged. (PO D)

Course Topics:
Design groups consist typically of three to five students. Each group has a faculty advisor. Topics may come from any of the following sources:
A design competition sponsored by a regional or national technical society.
The faculty advisor.
An industrial or engineering company.
A government agency.
Other Temple University departments such as the Medical School.
The students.
(CLO- 1-7)

Course Requirements:
1. Each student will work on a design project in a design group of three or four students (larger or smaller groups by special permission).
2. Each group will work with a faculty advisor and may have industrial advisors who will help them define a design project and work to complete it within one academic year. Periodic meetings with the advisors and with the department faculty are required.
3. Each group will make a formal written group proposal, progress report, and final report. In addition the groups will present their proposal and final report to the college and public in a formal meeting format and will present preliminary findings in a poster session. All students in the group are expected to contribute to these reports and presentations. In addition, each student is responsible for periodic informal progress reports and various other written assignments.
4. Each group will report periodically to the departments and advisors in Design Reviews including one formal Interim Design Review in January or February.

Course Grading:
This course will be graded collaboratively by the Faculty Advisor and the Course Coordinator. The grading is: Engineering Design – 50%; Communications (written and oral) – 50%. Individual participation will be evaluated by both the Faculty Advisor and the Course Coordinator on the basis of (1) participation in meetings, (2) self and group evaluations, (3) progress reports, (4) logs, and (5) the Design Reviews and will contribute to both the design grade and the communications grade.
ME 3506 - Fluids and Energy Laboratory

Catalog Description.

This laboratory aims to familiarize the students with different measurement techniques and devices to measure the fluid and air behavior of various systems. Experiments will include pressure and velocity measurements as well as modern transducers and pressure/flow regulators.

Course Goals and Program Outcomes:

<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>ABET Criterion</th>
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</thead>
<tbody>
<tr>
<td>Ability to design and conduct laboratory experiments as well as analyze and interpret data to improve process</td>
<td>B</td>
</tr>
<tr>
<td>Ability to communicate effectively in writing, speaking and making presentations</td>
<td>G</td>
</tr>
<tr>
<td>Ability to use the techniques, skills and modern technical tools necessary for technical or engineering practice</td>
<td>K</td>
</tr>
<tr>
<td>Familiarity with linear algebra and statistics</td>
<td>I</td>
</tr>
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</table>

Text books:


Instructor: Dr. Oleksandr Diloyan Ph. D.

Prerequisites or Co requisites

Introductory knowledge of Fluid Mechanics, Thermodynamics and Statics

Course Learning Objectives:

1. Design, plan, and conduct experiments in fluid mechanics
2. Analyze results using statistics and spread sheets
3. Communicate the results of the experiments in written reports and journals

<table>
<thead>
<tr>
<th>WEEK</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Labs</td>
</tr>
</tbody>
</table>
3 Lab #1: Orifice and Venturi Flow Meters
4 Lab #2: Air Velocity Measurement with a Pitot-Tube
5 Lab #3: Flow Visualization in a Smoke Tunnel
6 Lecture #2: Force, Lift and Drag, Refrigeration Cycle:
   Reading: 13.1-13.8; 15.8.
7 Lab #4: Impact Force of a Jet
8 Spring Recess
9 Lab #5: Vapor Compression Refrigeration Cycle
10 Lab #6: Lift and Drag in a Wind Tunnel
11 Lecture #3: Flow Measurement with Data Acquisition. Thermal
   Anemometry.
   Reading: 15.9; 16.1-16.5.
12 Lab #7: Friction Loss in Pipe Flows
13 Lab #8: Open Channel Flow
14 Lab #9: Hot-Wire Anemometry
15 Final Exam, Project Report submission and Journal Review/Grading

LABORATORY COURSE PROJECT ASSIGNMENT

Relates to Program Outcomes:
“B”. Ability to design and conduct laboratory experiments as well as analyze and interpret
data to improve processes.
“G”. Ability to communicate effectively in writing, speaking and making presentations.
“K”. Ability to use the techniques, skills and modern technical tools necessary for technical
or engineering practice.

To intensify students’ abilities to design and conduct laboratory experiments as well as analyze and interpret data to improve process we added design component in each lab course and created Lab Course Project Assignment. We divided each lab section to several small groups (from 4 to 7 students in each group) and gave them an assignment to design new laboratory experiment according the ASTM (American Society for Testing and Materials) and other standards, write handout manual, demonstrate the experiment, obtain data, perform required calculations and analyze the results. Maximum available points for Laboratory Course Project could be 15% from the Total Points.