ENGR 1001 - Engineering Computing
Fall 1998

1997-1999 Catalog Data: 1001 Engineering Computing. Prerequisite: Mathematics 1823 or concurrent enrollment. Introduction to computer programming and University computing facilities; program design and development; computer application exercises in engineering. (F, Sp, Su)

Prerequisite: MATH 1823

Textbook: Fortran 90 Programming, T.M.R. Ellis, I. R. Philips, and T.M. Lahey, Addison-Wesley Publishing Company, 1994.

References:

Course Objectives: Introduction to computer programming in Fortran 90; introduction to the University computing facilities; program design and development; computer application exercises in engineering.

Coordinator: Dr. Tom Bush, Assistant Professor, CEES

Prerequisites by Topic:

Topics:

ECN orientation, intro to text editing, running a simple FORTRAN program
Introduction to computing
Data types, arithmetic expressions, intrinsic functions
Subprograms and modules
Control of flow
Looping
Arrays
Formatted Input/Output

Schedule: One 110-minute lecture/laboratory session per week (requires a laptop computer).

Computer Usage:

Design Projects:

Laboratory Projects:

Written and/or Oral Communications:

Teamwork:

Assessment Methods Used:
1. Standard course evaluation form.

Contribution to Professional Component:
Engineering Science - 1 credit hours or 100%

Program Objectives : Related Strategy and Actions:
1: iv, viii

4: i

ABET 2000 Criterion 3 Contents:
a,e,k

Prepared by ______Tom Bush____________________________ Date

ENGR 1111 - Introduction to Computing
Spring 1999

1997-1999 Catalog Data: 1111 Introduction to Computing. Corequisite: Mathematics 1823 and access to a computer programmable in Basic language with printing capability. Introduces the student to computer program design and computer programming using Basic language. (F, Sp)

Prerequisite: MATH 1823

Textbook: Sundaresan and Jayaraman, *Computer Aided Problem Solving for Scientists and Engineers*, McGraw-Hill, New York, 1991

References:

Course Objectives:

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

Prerequisites by Topic:

1. Concurrent or previous enrollment in Engr. 1112
2. Lectures and laboratory-type exercises in computer aided problem solving as applied to engineering computation
3. Exercises keyed to Engr. 1112 topics

Topics:

1. Computer aided problem solving
2. Structured problem solving
3. Spreadsheet solution methods
4. Equation solver solution methods
5. Writing reports and interfacing software (input/output, file manipulation)
6. Word processing

Schedule:

Computer Usage:

Design Projects:

Laboratory Projects:

Written and/or Oral Communications:

Teamwork:

Assessment Methods Used:
1. Standard course evaluation.

Contribution to Professional Component:
Engineering Science - 1 credit hour or 100%

Program Objectives : Related Strategy and Actions:

1: iv, vii

ABET 2000 Criterion 3 Contents:
a,e,k

Prepared by ___________________________________ Date

ENGR 1112 - Introduction to Engineering
Spring 1999

1997-1999 Catalog Data: 1112 Introduction to Engineering. Prerequisite: Mathematics 1523. Engineering fundamentals/problem solving, (principles of mechanics, energy balances, simple circuits), graphics, specifications, ethics, contracts, introduction to the engineering library. (F, Sp, Su)

Prerequisite: MATH 1523

Textbook: Chapters from Eide et al, *Engineering Fundamentals and Problem Solving*, Second Edition, McGraw-Hill Publishing Co., 1986; Eisenberg, *Effective Technical Communication*, McGraw-Hill Publishing Co., 1992; and Martin-Schinzinger, *Ethics in Engineering*, Second Edition, McGraw-Hill Publishing Co.

References:

Course Objectives: Introduce students to the fields of engineering, the engineering design process, and engineering analysis tools.

Coordinator: Dr. Michael A. Mooney, Assistant Professor, School of Civil Engineering and Environmental Science.

Prerequisites by Topic:
1. College algebra and trigonometry
2. High school chemistry
3. High school physics

Topics:
1. Engineering profession/professional societies/curricula
2. Introduction to computers/Engineering Computing Network/Windows
3. The Engineering Method of Problem Solving
4. Introduction to Word Processing (Word)
5. Report Editing and Writing
6. Introduction to Spreadsheets (Excel)
7. Graphical Representation using spreadsheets
8. Graphical Analysis (Linear regression)
9. Introduction to Equations Solvers (Matlab)
10. Introduction to World Wide Web
11. Introduction to Ethics
12. Errors and Numerical Significance
13. Dimensions and Units
14. Design Process

Schedule: Two 50-minute lectures per week.

Computer Usage:

Design Projects:

Laboratory Projects:

Written and/or Oral Communications:

Teamwork:

Assessment Methods Used:
1. Standard course evaluation.

Contribution to Professional Component:
Engineering Science - 1.5 credit hour or 75%
Engineering Design - 0.5 credit hour or 25%

Program Objectives : Related Strategy and Actions:
2.i, 2.ii
3.i, 3.ii
4.i
5.ii

ABET 2000 Criterion 3 Contents:
a,c,d,e,k

Prepared by ___________________________________ Date

ENGR 1213 - Graphics and Design
Spring 1999

1997-1999 Catalog Data: 1213 Graphics and Design. Drafting, blueprint reading, orthographic projection, sketching and the graphical representation of engineering data. Students will carry out design projects related to their fields of specialization. **Laboratory** (F, Sp)

Prerequisite:

Textbook: Earle, James H., *Engineering Design Graphics*, 7th Edition, Addison-Wesley Publishers, 1992

References:

Course Objectives:

Coordinator: Dr. Hermann Gruenwald, Visiting Associate Professor, College of Business/MIS

Prerequisites by Topic:
1. College algebra and trigonometry
2. High school chemistry
3. High school physics

Topics:
1. Engineering design process
2. Pictorial drawing
3. Multiview drawing
4. Introduction to CAD (CADKEY)
5. Lettering
6. Graphing
7. Geometric construction with instruments
8. Dimensioning
9. Sectional views
10. Intermediate CADKEY
11. Drawing tolerances

Schedule:

Computer Usage:

Design Projects:

Laboratory Projects:

Written and/or Oral Communications:

Teamwork:

Assessment Methods Used:
1. Standard course evaluation.

Contribution to Professional Component:
Engineering Science - 2 credit hours or 67%
Engineering Design - 1 credit hour or 33%

Program Objectives : Related Strategy and Actions:

1: iv, vii, viii
2: i, ii, iii, iv
3: i
4: ii

ABET 2000 Criterion 3 Contents:
a,b,c,d,e,f,g,j,k

Prepared by: __Hermann Gruenwald___________________ Date:

ENGR 2113 - Rigid Body Mechanics
Spring 1999

1997-1999 Catalog Data: ENGR 2113: Rigid Body Mechanics. Prerequisite: 1112, Physics 2514 and Mathematics 2433 or concurrent enrollment in 2433. Vector representation of forces and moments; general three-dimensional theorems of statics; free bodies; two- and three-dimensional statically determinate frames; centroids and moments of inertia of areas. Absolute motion of a particle; motion of rigid bodies; rotating axes and the Coriolis component of acceleration; Newton's laws applied to translating and rotating rigid bodies; principles of work and energy and impulse and momentum in translation and rotation; moments of inertia of masses. (F, Sp, Su)

Prerequisites: CE 1112, Physics 2514 and Mathematics 2433 or concurrent enrollment in 2433

Textbook: R.C. Hibbeler, "Engineering Mechanics: Statics and Dynamics," 8th Ed., Prentice Hall, 1998

Course Objectives: Students will gain the ability to solve statics problems for professional practice and the professional examinations. These skills include proper use of free body diagrams, resolution of forces, and determinations of reactions.

Coordinator: Dr. Thomas D. Bush, Jr., Assistant Professor, School of Civil Engineering and Environmental Science

Prerequisites by Topic:
1. Basic understanding of mechanics principles from Physics.
2. Basic integral calculus and vector mathematics.

Topics:
Forces: Addition, Resolution, Resultants
2-D Particle Equilibrium
3-D Forces (Catesian Vectors)
Dot (Scalar) Product
3-D Particle Equilibrium
Moment about a Point (Vector Product)
Moment about a Line, Couples
Resultants of Force-Couple Systems
2-D Equilibrium of Rigid Bodies
Two- and Three-force Members
3-D Equilibrium of Rigid Bodies
Trusses
Frames and Machines
Centroids
Internal Actions
Moments of Inertia
Friction
Rectilinear Motion
Curvilinear Motion
Dynamic Equilibrium

Schedule: Lecture - three 50 minute periods or two 75 minute periods per week (150 minutes per week total).

Computer Usage: Occasional spreadsheet/program use for homework.

Design Projects: Occasional design oriented homework.

Laboratory Projects: None.

Written and/or Oral Communications: Written homework assignments and design project report.

Assessment Methods Used:
1. Standard course evaluation.
2. Student performance on homework and exams.

Contribution to Professional Component:
Engineering Science - 3 hours or 100%
Engineering Design - 0 or 0%

Program Objectives: Related Strategy and Actions:
1. ii

ABET 2000 Criterion 3 Contents:
a,e,g,k

Prepared by: Thomas D. Bush, Jr. Date:

ENGR 2153 - Strength of Materials
Spring 1999

1997-1999 Catalog Data: 2153 Strength of Materials. Prerequisite: 2113. Elementary elasticity and Hooke's law; Poisson's ratio; solution of elementary one- and two-dimensional statically indeterminate problems; stresses and strains due to temperature changes; stresses induced by direct loading, bending and shear; deflection of beams; area-moment and moment distribution; combined stresses; structural members of two materials; columns. (F, Sp)

Prerequisite: ENGR 2113

Textbook: Gere and Timoshenko, *Mechanics of Materials*, 3rd Edition, PWS-Kent Publishing Co., 1984

References:

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

Coordinator: Dr. Michael A. Mooney, Assistant Professor, School of Civil Engineering and Environmental Science

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

Topics:
1. Review of statics
2. Concepts of stress and strain
3. Hooke's Law and linear elasticity
4. Modulus of elasticity
5. Stress, strain and deflection of axially loaded members
6. Shear stress and strain
7. Shear modulus
8. Torsional stress and strain
9. Pure shear
10. Torsional deformations
11. Power transmission in circular shafts
12. Beams
13. Shear and bending moments diagrams
14. Bending stresses and strains in beams
15. Composite beams
16. Shear stresses in beams
17. Transformation of plane stress
18. Principal stresses and strains
19. Mohr's circle
20. Pressure vessels
21. Deflection of beams
22. Beam deflections by integration
23. Statically indeterminate structures
24. Columns and Euler's stability

Schedule: Two 75-minute lectures per week.
Computer Usage:

Design Projects:

Laboratory Projects:

Written and/or Oral Communications:

Teamwork:

Assessment Methods Used:

1. Standard course evaluation.

Contribution to Professional Component:
Engineering Science - 2.5 credit hour or 84%
Engineering Design - 0.5 credit hour or 16%

Program Objectives : Related Strategy and Actions:
1: iv, viii(Laptop)
2: i(L), ii(L), iii(L)
3: i
4: iv(L)

ABET 2000 Criterion 3 Contents:
a,c,e,k

Prepared by: Michael A. Mooney ______________ Date:

ENGR 2213 - Thermodynamics
Spring 1999

1997-1999 Catalog Data: 2213 Thermodynamics. Prerequisite: 1112, Mathematics 2433 and Physics 2524 or concurrent enrollment. First and second laws of thermodynamics are developed and applied to the solution of problems from a variety of engineering fields. Extensive use is made of partial differential calculus to interrelate the thermodynamic functions. (F, Sp, Su)

Prerequisite: ENGR 1112, MATH 2433 and PHYS 2524 or concurrent enrollment

Textbook: Classical Thermodynamics, William H. Sutton and Maurice L. Rasmussen, Internet Version, 1997 at www.ecn.ou.edu/sutton/www/america_files/thermo/book

References: Thermodynamic and Transport Properties, Claus Borgnakke and Richard E. Sonntag, Wiley, 1997.

Course Objectives: First and second laws of thermodynamics are developed and applied to the solution of problems from a variety of engineering fields. Extensive use is made of differential and partial differential calculus to interrelate thermodynamic properties and to utilize equations of state.

Coordinator: Dr. William H. Sutton

Prerequisites by Topics: Introduction to Engineering - use of standard computer software, some knowledge of partial derivatives, basic physics background in work and heat concepts.

Topics:
Chapter 1 - Basics, Definitions
Chapter 2 - Equations of State, Thermodynamic Property Relations
Chapter 3 - Use of Tables of Properties
Chapter 4 - Work
Chapter 5 - Heat Transfer
Chapter 6 - First Law for a Cycle
Chapter 7 - First Law for a Closed System
Chapter 8 - First Law for a Control Volume
Chapter 9 - Second Law for a Cycle
Chapter 10 - Second Law for Closed System and Control Volume
Chapter 11 - Thermodynamic Cycles

Schedule: Three 50 minute lectures per week. At least 1 lecture per week devoted to theory. At least one lecture per week devoted to problem discussion and examples

Computer Usage: Complete computer usage for the laptop section: lectures, text, problems, solutions, and solution methods. For the standard section, text, problems, some problem solutions (approximately 1/3 used computer)

Design Projects: Assignment of open ended problems. Laptop section had mini-project using a 2-component, cubic multiphase, equation of state (methane/propane mix) available over the internet from Shell Oil (SOPE)

Laboratory Projects:

Written and/or Oral Communications:

Teamwork: Students encouraged to team on homework solutions (on syllabus)

Assessment Methods Used:

1. Standard course evaluation.

Contribution to Professional Component:
Engineering Science - 2.5 credit hour or 84%
Engineering Design - 0.5 credit hour or 16%

Program Objectives : Related Strategy and Actions:
1. ii

ABET 2000 Criterion 3 Contents:
a,c,e,h,j,k

Prepared by_______ Dr. William H. Sutton ___________________________Date

ENGR 2313 - Structure and Properties of Materials
Spring 1999

1997-1999 Catalog Data: **ENGR 2313 Structure and Properties of Materials**. Prerequisite: ENGR 1112, Chemistry 1315 and concurrent enrollment in Physics 2524. The behavior of materials under various conditions and environments is correlated to atomic and molecular structure and bonding. (F, Sp)

Prerequisite: ENGR 1112, Chemistry 1315, concurrent enrollment in Physics 2524

Textbook: Materials Science and Engineering, An Introduction by W.D. Callister. 5th. Edition, J.Wiley, N.Y. 1999

References:

Course Objectives: Structure and Properties of Materials is a course for the students to become familiar with the fundamentals of Materials Science and Engineering, the main types of materials (metals, ceramics, polymers, and composites), their processing and applications. At the end of the course, the students will understand the relationships between the internal structure of materials and their properties. They will be able to appreciate the significance of materials characterization, and understand the relevance of materials in engineering, as well as the criteria used in industry for materials selection and design.

Coordinator: Daniel E. Resasco, Smalley Presidential Professor of Chemical Engineering, School of Chemical Engineering and Materials Science

Prerequisites by Topic:

Topics:

1. Introduction: Importance of Materials. Types of Materials. Structure and Properties. Definitions. Materials Science (SPT) Triangle. Industrial Design.
2. Structure: Atomic Structure. Electron Configuration. Chemical Bond. Ionic, Covalent, and Metallic Bond. Crystal Structures. Cubic systems BCC and FCC. Miller Index. Directions. Planes. Unit Cell Computations. Density Computations. Planar Density. X-ray Diffraction. Determination of Interplanar Distances. Identification of phases. Imperfections in Solids. Solid State Diffusion. Activated Processes. Non-steady state diffusion. Solidification. Grain Boundaries. Microscopic Characterization. Optical and Electron Microscopes
3. Mechanical Properties: Mechanical properties of Metals. Stress and Strain. Tensile and Compression Tests. Elastic and Plastic Deformation. Ductility. Strength. Toughness. True stress and stress. Hardness. Variability of Properties. Fracture. Ductile and Brittle Fracture. Fracture Toughness. Impact fracture. Fatigue
4. Phase Diagrams: Equilibrium. Isomorphous Systems. Eutectic Systems. The iron-carbon system. Austenite and Cementite. Eutectoid and Peritectic Reactions
5. Transformation of Metal Structures: Phase Transformations. Kinetics. Isothermal Transformations. Continuous Cooling Transformation Diagrams. Iron-carbide alloys. Steel Production. Steel microstructures. Pearlite. Bainite. Martensite. Spheroidite. Tempered Martensite. Heat Treatment of Steels. Hardenability. Jominy Test. Hardness Profiles
6. Metal Alloys: Ferrous and Non-ferrous alloys. Cast irons. Copper alloys. Bronzes. Brass. Aluminum alloys.
7. Ceramic Materials: Crystal Structures. Coordination Number. Tetrahedral and Octahedral Positions. Rocksalt structure. MgO. Corundum, Al_2O_3. Diamond. Silicate structure. Glasses. Ceramic Phase Diagrams. Stabilized Zirconia. Synthesis and Transformation. Mechanical Properties of Ceramics. Brittle Fracture. Ceramic Dielectrics.

8. Polymers: Structure of Polymer Molecules. Molecular Weight Distribution. Crystallinity of Polymers. Polymerization Reactions. Manufacture of Polyethylene. Synthesis and Transformation. Thermosetting and

Thermoelastic Polymers. Mechanical Properties. Stress-Strain.
9. Electrical and Thermal Properties: Electrical Conduction. Ohm's Law. Resistivity. Semiconductivity (n-typen and p-type). Energy band structure in solids. Electron Mobility. Influence of Temperature. Thermal Properties. Heat Capacity. Thermal Conductivity. Thermal Expansion.

Computer Usage:
1. Extensive use of computer in class for presentation of crystal structures, phase transformation and testing of mechanical properties, including animation and simulations.
2. Extensive use of word processing and spreadsheets in homework assignments and project papers
3. CD ROM included with text for demonstrations, exercises, and homework assignments

Design Projects: N/A

Laboratory Projects: N/A

Written and/or Oral Communications:
1. Written report on a selected topic at the end of the semester. Graded for content, presentation, and grammar.
2. Informal in-class presentations of results of group discussions

Teamwork:
Extensive teamwork in-class and outside the classroom. Student groups are formed at the beginning of the semester. They solve problems in-class and work together on selected homework assignments and a final term project.

Assessment Methods Used:
1. Standard course evaluation.
2. Mid-term evaluation about the progress of the course and the learning process
3. Group evaluations

Contribution to Professional Component:
Engineering Science – 3 credit hours or 100 %

Program Objectives : Related Strategy and Actions:

ABET 2000 Criterion 3 Contents:
a,d,k

Prepared by Daniel E. Resasco Date April 8, 1999

ENGR 2613 - Electrical Science
Spring 1999

1997-1999 Catalog Data: **2613 Electrical Science.** Prerequisite: 1112, Mathematics 2423; Physics 2524 or concurrent enrollment. Formulation and solution of circuit equations, network theorems, sinusoidal steady-state analysis, simple transients. (F, Sp, Su)

Prerequisite: ENGR 1112, MATH 2423; PHYS 2524 or concurrent enrollment

Textbook: Electric Circuits by Nilsson

References:

Course Objectives: Provide basic circuits and systems knowledge to a wide-disciplined audience.

Coordinator: John Fagan, Associate Professor

Prerequisites by Topic:

Topics:
10 Basic Circuit Element Components Resistor, Capacitor, Inductor, Voltage Source, Current Source
20 Basic Network Configurations
30 Introduction to Topology
40 Introduction to Matrix Notation and Matrix Algebra
50 Matrix representation of Networks
60 Introduction of the Laplace Transform
70 Use of Laplace Transform for Network Analysis
80 Loop Methods
90 Node Methods
100 Matrix representation of multi degree of freedom problems
110 Matrix by Inspection
120 Thevenin and Norton Networks
130 Use of Laplace Matrix for solution of multi degree of freedom high order systems
140 Introduction to mechanical systems
150 Analysis of Electro Mechanical Systems
160 The Phasor solution as a steady state product
170 Introduction of the Transfer Function

Schedule: Three 50 minute lectures per week.

Computer Usage: Use of PC and packages such as MATLAB

Design Projects: Semester design project conducted in team format.

Laboratory Projects:

Written and/or Oral Communications: Formal presentation of design project.

Teamwork: Team design project.

Assessment Methods Used:
1. Standard course evaluation.

Contribution to Professional Component:
Engineering Science - 2.5 credit hour or 84%
Engineering Design - 0.5 credit hour or 16%

Program Objectives : Related Strategy and Actions:
1.ii, 2.ii

ABET 2000 Criterion 3 Contents:
a,e,h,i,j,k

Prepared by ______John Fagan_____________________________ Date

ENGR 3223 - Fluid Mechanics
Spring 1999

1997-1999 Catalog Data: **3223 Fluid Mechanics.** Prerequisite: 2213, Mathematics 2433; concurrent enrollment in 2113 and Mathematics 3113. Coverage of the fundamentals of fluid statics and dynamics. Formulation of the equation of fluid flow, i.e., Navier-Stokes Equations, Eulers Equations, Bernoulli Equations, etc. and their application. Examples of ideal fluid flow and viscous fluid flow, such as flow in open and closed conduits. (F, Sp, Su)

Prerequisite: ENGR 2213, MATH 2433; concurrent enrollment in ENGR 2113 and MATH 3113.

Textbook: V.L. Streeter and E.B. Wylie, *Fluid Mechanics*, 8th Edition, McGraw-Hill Publishing Co., 1985.

References:

Course Objectives: Introduce students to fundamental concepts of hydrostatics and hydrodynamics. Then have student apply their fundamental understanding of the principles of fluid dynamics to a design problem.

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

Prerequisites by Topic:
1. Differential calculus
2. Integral calculus
3. Elementary vector calculus
4. Energy balances
5. Statics

Topics:
1. Introduction--fluid properties and definitions
2. Fluid statics
3. Fluid flow
4. Dimensional analysis and dynamic similitude
5. Viscous flow
6. Ideal-fluid flow
7. Fluid measurements
8. Compressible fluid flow
9. Steady closed conduit flow
10. Steady flow in open channels

Schedule: Three fifty minute lectures per week. No separate section or time scheduled for laboratory.

Computer Usage:
1. Computers are utilized in several forms, mostly PC applications and hand-held units are widely available. However, the Engineering Computer network and the University Mainframe are available to any who might desire to use them. Fortran is also available in some applications.
2. The excellent textbook now being used is filled with BASIC computer programs that are immediately available to students over a wide range of applications, from bouyance problems to complicated network systems of several hundred pipes and nodes.
3. Students are encouraged to use programming where expedient.

Design Projects: Design a vehicle that will travel 75' in a horizontal plane powered by one gallon of water. The vehicle must travel from point A to point B in the shortest time possible and stop exactly at point B.

Laboratory Projects:

1. Develop expression for hydraulic jump. Compare mathematical expression with experimental results use expression to design scale-up version of model.
2. Compare theoretical and experimental values of friction factor for straight piping system. Use a velocity that will ensure that flow is turbulent (i.e., P_1= 10 psi). The piping system is cast iron pipe. Compare the experimental value to that obtained from Moody. You must determine: e, L, D, Q, and V.
3. Determine the loss coefficient for an elbow. Use cast iron elbow (screwed) with P_1 =30 psi. In addition, use the experimental friction factor determined in part 1. You must determine e, L, D, Q, and V. Compare to that obtained from table. HINT: use the tee as an elbow in the calculations.
4. A model, scale 1:20, is used to determine the headloss of the prototype. Use the values of friction factor and loss coefficient determined in part 1 and 2. Set model for P_1= 35 psi. Present both experimental headloss of model as well as calculated value. In your final answer, give the EGL and HGL for the prototype.
5. Develop expression for entrance length of developed flow using drain pipe system.

Written and/or Oral Communications:
Present concept of design prototype as oral presentation. Final design report that must include problem statement, background, goals, target specifications, plan of approach, time line and budget, and summary.

Teamwork:

Assessment Methods Used:
1. Standard course evaluation.

Contribution to Professional Component:
Engineering Science - 3 credit hours or 100%

Program Objectives : Related Strategy and Actions:
1: iv, vi
2: i

ABET 2000 Criterion 3 Contents:
a,b,c,e

Prepared by: Keith A. Strevett Date:

ENGR 3293 – Applied Engineering Statistics
Spring 1999

1997-1999 Catalog Data: **G3293 Applied Engineering Statistics.** Prerequisite: 1112, 1001 or CS1313 or 1323; Mathematics 2433. Introduction to probability, one and higher dimensional random variates, functions of random variables, expectation, discrete and continuous distributions, sampling and descriptive statistics, parameter estimation, use of statistical packages. Not available for graduate credit for students in engineering disciplines. (F, Sp, Su)

Prerequisite: ENGR 1112, ENGR 1001 or CS 1313 or 1323, MATH 2433

Textbook: Montgomery, D.C. and G.C. *Runger, Applied Statistics and Probability for Engineers*, John Wiley and Sons Inc., New York, 1994.

References: None

Course Objectives: The course objective is to provide the student knowledge and insights into basic probability and statistics. At the completion of the course, the student should be comfortable with the basic concepts of probability, familiar with a variety of probability distributions, be able to calculate descriptive statistics and apply inferential statistics concepts.

Coordinator: Jerry D. Dechert, Assistant Professor, Industrial Engineering

Topics Covered: Descriptive statistics, Counting methods, Probability, Discrete random variables, Continuous random variables, Functions of Random Variables, Joint probability distributions, Point estimation, Interval estimation, and Hypothesis testing

Computer Usage: MSExcel

Design Projects: Optional, Team Bonus Assignment

Laboratory Projects: None

Written and/or Oral Communications: Optional, Bonus Assignment

Team Work: Optional

Assessment Methods Used: Homework, Exams and Bonus assignments (optional)

Class/Laboratory Schedule:
Three hours of classroom lecture and discussion, including software demonstrations and interactive exercises

Contribution of Course to Meeting the Professional Component:
Engineering Science - 3 credit hours or 100%

Program Objectives: Related Strategy and Actions:
1.i

ABET 2000 Criterion 3 Contents:
a,b,d,e,g,j,k

Prepared by: Jerry D. Dechert, Date April 12, 1999

ENGR 3510.018 - WERC Research
Spring 1999

1997-1999 Catalog Data: ENGR 3510 - Selected Topics. 0 to 3 hours. Selected topics on current or special topics relating to engineering to be structured for students in engineering and other areas. (F, Sp, Su)

Prerequisites: None

Textbook: None

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

Course Objectives: To give students 1st exposure to logical approach to complex problems. To gain "hands on" experience with experimental equipment and techniques; ability to analyze data and develop reports, and to function within a team environment.

Prerequisites by Topic:

Topics:
By week:
1. Discussion of problem solving; discussion of searching for information; division of responsibilities.
2. Visit Engineering Library.
3. Begin: Working on HPLC method, Working on design, Searching for information, (whenever soil arrives) Set up microcosms.
4. Continue work on HPLC method and design.
5. Testing of process(es), work on design.
6. Submission of completed paper to instructor for obtaining audits.
7. Testing of process(es), work on design.
8. Submission of paper to WERC.
9. Continue testing; refinement.
10. Begin work on poster.
11. Pre-competition quiz.
12. Wrap up; begin packing.
13. Poster completed.
14. Leave for Las Cruces.
15. Discussion of "competition experience."
16. Submit written evaluation of project experience.

Schedule: Lecture - 2.0 hours per week. Team working sessions - 3 hours per week. Lab - 3.0 hours per week.

Computer Usage: Part of weekly submission and data analysis.

Design Projects: Integrated into lecture topic and set by WERC. 1999 task was to develop and demonstrate in-situ soil remediation (preferably bio-remediation) of High Explosive (HE) and Research Development Explosive (RDX) in tight clay soils. The process must be demonstrated using soil samples packed into test cylinders which simulate natural permeability and porosity.

Laboratory Projects: Integrated into lecture and design.

ENGR 3510.018 - WERC Research (Continued)

Written and/or Oral Communications:
1. Weekly oral submission of technical approach.
2. Term (competition) paper.
3. Oral presentation at competition.

Assessment Methods Used:
1. Standard course evaluation.

Contribution to Professional Component:
Engineering Design - 3 credit hour or 100%

Program Objectives and Related Strategy and Actions:
1: v, vi
2: i, ii, iii, iv
4: ii, iii, iv, vi

ABET 2000 Criterion 3 Contents:
a,b,c,d,e,g,h,i,j,k

Prepared by: Keith A. Strevett Date:

ENGR 3723 - Numerical Methods for Engineering Computation
Spring 1999

1997-1999 Catalog Data: **†G3723 Numerical Methods for Engineering Computation.** Prerequisite: 1112, 1001 or Computer Science 1313 or 1323, and Mathematics 3113. Basic methods for obtaining numerical solutions with a digital computer. Included are methods for the solution of algebraic and transcendental equations, simultaneous linear equations, ordinary and partial differential equations, and curve fitting techniques. The methods are compared with respect to computational efficiency and accuracy. (F, Sp, Su)

Prerequisite: ENGR 1112, ENGR 1001 or CS 1313 or 1323, and MATH 3113

Textbook: S.C. Chapra and R.P. Canale, "Numerical Methods for Engineers", 3nd Edition, McGraw-Hill Book Company, New York, New York, 1998.

References: Computer software manuals, computer language manuals.

Course Objectives: It is expected that the student will gain a fundamental understanding of the basic methods for obtaining numerical solutions to mathematical problems by use of the digital computer. Included in these methods are Taylor Series expansion and finite differencing techniques, root finding techniques, the solution of simultaneous linear equations, curve fitting techniques, numerical integration and differentiation, the solution of ordinary differential equations, and eigenvalue problems. The student will gain insight into the performance of competing methods, their advantages and disadvantages.

Prerequisites by Topic:
1. Computer literacy
2. Knowledge of programming language and numerical engineering software
3. Differential equations

Topics: 1. Review of Computers and Programming; Approximations and Errors Taylor Series; Finite Differences: Forward, Backward, Central Differencing Roots of Equations: Bisection, Newton-Raphson Method, Modified Newton's Method, Secant Method Simultaneous Linear Equations: Matrix Operations, Gauss and Gauss-Jordan Elimination Techniques, Gauss-Seidel Iteration, LU-DecompositionCurve Fitting: Least Squares, Gregory-Newton InterpolationNumerical Integration and Differentiation: Trapezoidal and Simpson's Rules, Romberg Integration, Gauss Quadrature;Numerical Differentiation Ordinary Differential Equations: Euler Method, Runge-Kutta and Adams Formulas, Predictor-Corrector Methods; Eigenvalue ProblemsTime Permitting: Partial Differential Equations: Elliptic, Parabolic, and Hyperbolic Equations

Class Schedule: Three 50-minute lectures per week, typically Monday/Wednesday/Friday

Computer Usage:
1. Students are asked to use spreadsheets for homework assignments or such programs as MathCad, MatLab, etc.
2. Some basic programming is required.

Assessment Methods Used:
1. Standard course evaluation

Contribution to Professional Component:
Engineering Science - 3.0 credits or 100%

Program Objectives : Related Strategy and Actions:
1. ii

ABET 2000 Criterion 3 Contents:
a

Prepared by:_____Alfred G. Striz__________________________Date: May 1999

ENGR 4223 - Fundamentals of Engineering Economy
Spring 1999

1997-1999 Catalog Data: **G4223 Fundamentals of Engineering Economy.** Prerequisite: permission. Introduction to concepts of economic analysis to optimize benefits utilizing multivariant, multistaged mathematical models. Topics include cost and worth comparison, capital costs and sources, time value of money, replacement economics, taxes, economic efficiency of alternate designs, minimum costs and maximum benefits, risk and uncertainty, and economics of work schedules. (F, Sp, Su)

Prerequisite: A course in Calculus, including the knowledge of limits, derivatives, finite and infinite series.

Textbook: *Principles of Engineering Economic Analysis*, by J. A. White, K. E. Case, D. B. Pratt, and M. H. Agee, 4^{th} edition, John Wiley and Sons, 1998

References: -*Contemporary Engineering Economics*, by Chan Park, Addison Wesley, 2^{nd} Edition, 1997.
- Schaum's Outlines in *Engineering economics*, by J. A. Sepulveda, W. E. Souder, and B. S. Gottfried, McGraw-Hill, 1984.

Course Objectives: To introduce students to the concept of time value of money and the techniques of economic comparison of alternatives. Prepares students to handle the engineering economy component of professional engineering registration exam.

Coordinator: Dr. Adedeji B. Badiru, Professor of Industrial Engineering

Prerequisites by Topic: Topics build on each other sequentially. An understanding of the preceding topics is required before proceeding to subsequent topics.

Topics and Schedule:

1. Cost Concepts: Terminology, definitions and basic formulas for present economic studies
2. Time value of Money:
   - Cashflow diagrams and their derivation, Series of cashflows (single sums, uniform, gradient, geometric);
   - Multiple and continuous compoundings;
   - Applications: Amortized and Add-On Loans, Bonds;
   - Measuring the Worth of Investments: PW, AW, FW, IRR, ERR, B/C, Payback, Capitalized Worth
   - Comparison of Alternatives, Replacement Analysis, Linear Programming in Capital Budgeting
   - Depreciation: Physical and Accounting (Book and Tax Depreciation), Depletion, Corporate Tax Calculations.
   - Multiattribute Decision making in Economic Analysis: Noncompensatory and Compensatory Models
   - Sensitivity Analysis

Computer Usage: Cashflow modeling and calculations using Excel and Lindo

Design Projects:

Laboratory Projects:

Written and/or Oral Communications:

Teamwork:

Assessment Methods Used: Exams, Homeworks (including Software Assignments)

Contribution to Professional Component:

Program Objectives : Related Strategy and Actions:
180 ii, vii
190 i, iii
200 i
210 ii, vii

ABET 2000 Criterion 3 Contents: Economic analysis of engineering projects
d, f, g, i, k

Prepared by ___________________________________ Date