CSC 112 Syllabus

Course: CSC 112

Credit Hours: 3

Course Title: Introduction to Computing - FORTRAN

Course Description:

Problem solving through writing FORTRAN programs. Particular elements include: careful development of FORTRAN programs from specifications; documentation and style; appropriate use of control structures, data types and subprograms; abstraction and verification; engineering applications.

Prerequisite(s): E 115, MA 141

Textbook(s) and/or other required material:

Fortran 95/2003 for Scientists and Engineers, Stephen J. Chapman, McGraw-Hill, Third Edition, 2008.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

Upon successful completion of this course, a student will be able to solve problems through writing FORTRAN programs. Students are expected to be able to develop FORTRAN programs from specifications and document those programs in a style permitting the maintaining and altering of the programs by a third party. Students will understand the use of control structures, data types, input and output processes, and both recursive and nonrecursive subprograms, and the use of modules. Students will know how to verify that programs are running correctly, and will be equipped to write FORTRAN programs for engineering applications.

Students will comprehend some of the theory that underpins computation and the FORTRAN family of programming languages including number systems and representations in the computer, machine language protocols (e.g., floating point representations), program correctness, automata theory (e.g., Turing machines), formal languages (e.g., Chomsky hierarchy) and recursion.

Topics covered:

Programming structures, variable/data types, read/write/print statements, debugging/error corrections
IF Statements
DO Loops
Formatting
File Input and Output
Arrays
Subroutines and Functions
Modules
Recursive Functions and Subroutines

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Class/laboratory schedule (sessions per week and duration of each session):

Two 50 minute lectures twice a week
Three 1 hour laboratory sessions each week

Contribution of course to meeting the requirements of Criterion 5 - other:

3 hours - Other - programming

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

N/A

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	Major	Students solve problems by writing various FORTRAN programs.

Person who last prepared this description and date of preparation:

- Raubenheimer, Dr. Dianne Carol (cdrauben) - Mar 2nd, 2010 (11:42am)

ECE 331 Syllabus

Course: ECE 331

Credit Hours: 3

Course Title: Principals of Electrical Engineering

Course Description:

Concepts, units and methods of analysis in electrical engineering. Analysis of d-c and a-c circuits, characteristics of linear and non-linear electrical devices; principles of Operational Amplifiers; transformers; motors; and filters.

Prerequisite(s): MA 241, PY 208

Textbook(s) and/or other required material:

Electrical Engineering Principles and Applications, Allan R. Hambley, Prentice Hall, 4th Edition, 2008.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

1.Analyze AC and DC circuits using Kirchhoff's Laws.
2.Solve basic circuit problems using nodal and mesh analysis.
3.Perform the analysis of first order R-C and R-L transient circuits.
4.Use transfer functions and Bode plots to analyze Filter circuits in the frequency domain.
5.Explain AC steady-state power and basic principles of power delivery.
6.Analyze currents and voltages in non-linear diode circuits.
7. Perform analysis of motors.

Topics covered:

1.Kirchhoff's Laws and basic R, L, C, Transformer concepts.(6)
2.Resistor Networks. (2)
3.Node Voltage Analysis(1)
4.First Order R-C and R-L Transient Circuits. (2)
5.AC Sinusoidal Circuit Analysis. (8)
6.Filters. (5)
7.Operational Amplifiers. (2)
8.Diodes.(3)
9. Motors.(3)
10.Transistors.(1)

Class/laboratory schedule (sessions per week and duration of each session):

Three 50-minutes lectures per week.

Contribution of course to meeting the requirements of Criterion 5 - other:

Contribution of course to meeting the requirements of Criterion 5 - math and basic

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sciences:

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hours.

Contribution of course to meeting the requirements of Criterion 5 - general education:

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Students analyze d-c and a-c circuits. They characterize linear and non-linear electrical devices, study transfer functions and analyze circuits in the frequency domain.
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	Major	Students solve Electrical Enineering problems using the analysis tools they are given in the course.
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	Intermediate	Students from other engineering departments learn basic electrical engineering analysis techniques to satisfy their program criteria.

Person who last prepared this description and date of preparation:

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content

- Ozturk, Dr. Hatice O (hoo) - Aug 17th, 2009 (04:53pm)

ISE 311 Syllabus

Course: ISE 311

Credit Hours: 3

Course Title: Engineering Economic Analysis

Course Description:

Engineering and managerial decision making. The theory of interest and its uses. Equivalent annual costs, present worths, internal rates of return, and benefit/cost ratios. Accounting depreciation and its tax effects. Economic lot size and similar cost minimization models. Sensitivity analysis. Cost dichotomies: fixed vs. variable, and incremental vs. sunk: use of accounting data. Replacement theory and economic life. Engineering examples.

Prerequisite(s): MA 141 - Calculus I

Textbook(s) and/or other required material:

Newnan, Donald G.; Lavelle, Jerome P.; and Eschenbach, Ted G., ENGINEERING ECONOMIC ANALYSIS, Tenth Edition, Oxford University Press, 2009.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

a. Formulate and solve compound interest problems using a minimum number of standard ASEE interest factors.

b. Using cash flow diagrams and interest factors, correctly evaluate whether a given proposed capital investment project should be undertaken.

c. Compare and contrast alternative indices of project worth, and determine which ones are appropriate for any given situation.

d. Make correct use of accounting and other cost information, including relevant incremental costs and tax effects, and discarding irrelevant sunk costs.

e. Use EXCEL spreadsheet to make and explain complex mortgage tables, 2-dimensional and 3-dimensional net present value charts, and other sensitivity analyses for proposed engineering projects.

f. Include and explain relevance of intangible factors and uncertainties in evaluations of engineering projects.

g. Present results of analyses in a lucid, informative manner with well-explained graphs, tables and text material.

Topics covered:

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a. Time Value of Money and Economic Equivalence (9 classes).

b. Comparing Alternative Investments: Present Worth, Annual Worth, Internal Rate of Return, and Benefit/Cost Ratio Analyses (8 classes).

c. Accounting Depreciation and Income Taxes (5 classes).

d. Replacement Analysis, Inflation, and Rationing Capital (3 classes).

e. Sensitivity, Break-Even, Risk, Uncertainty, and Multistage Sequential Analyses (4 classes)

Class/laboratory schedule (sessions per week and duration of each session):

2 days per week, 8:30-9:45 a.m.; 75 minutes of lecture.

Contribution of course to meeting the requirements of Criterion 5 - other:

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

Students are exposed to a powerful application of the mathematical tools they have learnt in prior classes.

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

Course provides students the background for economic analysis of engineering projects.

Contribution of course to meeting the requirements of Criterion 5 - general education:

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Weekly written homework is required, collected, graded & discussed, & solutions of further problems on the same topics are carefully evaluated & expected to be better. 3 major preliminary exams & a final exam are carefully graded & counted heavily.
Outcome B	Basic	

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome C	Intermediate	
Outcome D	Basic	
Outcome E	Major	Class discussion, homework problems & exams cover a wide variety of applications in all major fields of engineering. Assumptions required are carefully pointed out & discussed.
Outcome F	Intermediate	
Outcome G	Basic	Clarity & thoroughness in English language explanation & presentation of results are emphasized & critiqued throughout.
Outcome H	Intermediate	
Outcome I	Basic	
Outcome J	Intermediate	
Outcome K	Intermediate	Two major required homework exercises make advanced use of the EXCEL spreadsheet including its graphical capabilities for sensitivity analysis & consideration of uncertainties.

Person who last prepared this description and date of preparation:

- Uzsoy, Reha (ruzsoy) - May 2nd, 2010 (04:27pm)

MAE 206 Syllabus

Course: MAE 206

Credit Hours: 3

Course Title: Engineering Statics

Course Description:

Basic concepts of forces in equilibrium. Distributed forces, fluid forces, frictional forces. Inertial properties. Application to machines, structures, and systems.

Prerequisite(s): Prerequisite: C- or better in MA 241 and PY 205. Co requisite: MA 242

Textbook(s) and/or other required material:

Engineering Mechanics: Statics, 8th Edition, R. C. Hibbeler, Prentice-Hall, 1998.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 206 through their mastery of the following course objectives. Through the study of MAE 206 the student will be able to:

1. Model physical systems using free body diagrams;
2. Comprehend static equilibrium for particles, rigid bodies, trusses, and frames/machines;
3. Solve for reaction forces and moments;
4. Understand and apply friction and fluid pressures;
5. Calculate and graph internal forces and moments;
7. Calculate centroids and moments of inertia;

Topics covered:

1. Math and Physics Review (2)
2. Particle Equilibrium (4)
3. Force Resultants (2)
4. 2-D Equilibrium (4)
5. 3-D Equilibrium (4)
6. Distributed Forces (1)
7. Centroids (2)
8. Moments of Inertia (2)
9. Friction (4)
10. Fluid Statics (2)
11. Beams (2)
12. Beams: Shear and Bending (3)
13. Trusses (3)
14. Frames & Machines (3)
15. Review (2)
16. Exams (2)

MAE 206 Syllabus

Class/laboratory schedule (sessions per week and duration of each session):

MAE 206 is offered in both a T/TH and a MWF format. The T/TH format includes 25 lectures and 3 exams (14 weeks), 2 days per week, 75 minute lectures. The MWF format includes 39 lectures and 4 exams (14 weeks), 3 days per week, 50 minute lectures.

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3hrs, Engineering Science.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Vector algebra, linear algebra, some calculus
Outcome B	N/A	
Outcome C	Basic	Calculate internal forces and moments
Outcome D	N/A	
Outcome E	N/A	
Outcome F	Major	Force and moment calculations for typical engineering structures
Outcome G	Major	Free body diagrams, sample calculations
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	Major	Systematic and structured approach to problem solving

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content

Person who last prepared this description and date of preparation:

- Raubenheimer, Dr. Dianne Carol (cdrauben) - Feb 17th, 2011 (02:09pm)

MAE 208 Syllabus

Course: MAE 208

Credit Hours: 3

Course Title: Engineering Dynamics

Course Description:

Kinematics and kinetics of particles in rectangular, cylindrical and curvilinear coordinate systems; energy and momentum methods for particles; kinetics of systems of particles; kinematics and kinetics of rigid bodies in two and three dimensions; motion relative to rotating coordinate systems.

Prerequisite(s): 2.5 GPA or higher, MA 242, C- or better in MAE 206 or CE 214

Textbook(s) and/or other required material:

Hibbeler, R.C., Engineering Mechanics: Dynamics, 11th Edition, Pearson Prentice Hall, 2007. Reference: J. L. Meriam and L. G. Kraige, 6th Edition, Engineering Mechanics: Dynamics, John Wiley & Sons, 2007.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 208 through their mastery of the following course objectives. Through the study of MAE 208 the student will be able to:
1. Analyze the motion (displacement, velocity and acceleration) of particles in rectangular, cylindrical and curvilinear coordinate systems using vector mechanics; calculate relative motion relationships between translating particles;
2. Apply Newton's 2nd law of motion to relate the forces acting on a particle to the resulting motion of the particle; use the work-energy method to predict particle motion; use impulse-momentum equations to solve impact problems involving particles;
3. Analyze the motion of rigid bodies undergoing both translation and rotation; compute the derivatives of vectors resulting from both changes in magnitude as well as direction; analyze motion relative to rotating reference frames in two and three dimensions;
4. Determine the inertia descriptions of a rigid body relative to a coordinate system; analyze the plane motion of a rigid body using Euler's equations.

Topics covered:

1. Particle kinematics (9) 2. Particle dynamics (5)
3. Work-energy, momentum methods (6) 4. Rigid body kinematics (9)
5. Rigid body dynamics (9) 6. Review and tests (4)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 3 days per week for 50 minute lectures (or 2 days per week for 75 minute lectures)

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Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hrs, Engineering Science.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	Major	***FILL IN
Outcome I	Major	***FILL IN
Outcome J	Major	***FILL IN
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 22nd, 2010 (04:24pm)

MAE 301 Syllabus

Course: MAE 301

Credit Hours: 3

Course Title: Engineering Thermodynamics I

Course Description:

Introduction to the concept of energy and the laws governing the transfers and transformations of energy. Emphasis on thermodynamic properties and the First and Second Law analysis of systems and control volumes. Integration of these concepts into the analysis of basic power cycles is introduced.

Prerequisite(s): MA 242, PY 208 or PY202

Textbook(s) and/or other required material:

Cengel, Y. A. and Boles, M. A., Thermodynamics: an Engineering Approach, 6th ed., The McGraw-Hill Companies, New York, 2008.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 301 through their mastery of the following course objectives. Through the study of MAE 301 the student will be able to:
1. Determine properties of real substances, such as steam and refrigerant 134-a, and ideal gases from either tabular data or equations of state.
2. Analyze processes involving ideal gases and real substances as working fluids in both closed systems and open systems or control volumes to determine process diagrams, apply the first law of thermodynamics to perform energy balances, and determine heat and work transfers.
3. Analyze systems and control volumes through the application of the second law.
4. Analyze the basic Otto and Rankine cycles

Topics covered:

Based on 3 classes per week:
1. Basic Concepts (4) 2. Properties of pure substances (4)
3. Energy transfer by heat, work, and mass (4) 4. The first law of thermodynamics (9)
5. The second law of thermodynamics (5) 6. Entropy and 1st & 2nd law applications (9)
7. Introduction to power cycles (2) 8. Review and tests (5)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 3 days per week for 50 minute lectures or 2 days per week for 75 minute lectures

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic

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sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hrs, Engineering Science.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	apply principles of math, science and engineering in solving MAE 301 problems
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	Major	identify, formulate, and solve engineering problems associated closed and open systems using both ideal gases and real substances as working fluids
Outcome F	Major	***FILL IN
Outcome G	N/A	
Outcome H	Major	***FILL IN
Outcome I	Major	***FILL IN
Outcome J	Major	***FILL IN
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 22nd, 2010 (04:25pm)

MAE 302 Syllabus

Course: MAE 302

Credit Hours: 3

Course Title: Engineering Thermodynamics II

Course Description:

Continuation of Engineering Thermodynamics I with emphasis on the analysis of power and refrigeration cycles and the application of basic principles to engineering problems with systems involving mixtures of ideal gases, psychrometrics, nonideal gases, chemical reactions, combustion, chemical equilibrium analysis, and one-dimensional compressible flow.

Prerequisite(s): C- or better in MAE 301 and CSC 112

Textbook(s) and/or other required material:

Cengel, Y. A. and Boles, M. A., Thermodynamics: an Engineering Approach, 6th ed., The McGraw-Hill Companies, New York, 2008.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 302 through their mastery of the following course objectives. Through the study of MAE 302 the student will be able to:

1. Analyze ideal gas and steam power cycles and refrigeration cycles to determine system components and process diagrams, perform energy balances, determine heat and work transfers, calculate the cycle efficiency or coefficient of performance and design power/refrigeration cycles or processes for cycle components;
2. Calculate properties of ideal gas mixtures and determine the properties of dry air-water vapor mixtures, plot processes on a psychrometric chart, and analyze process involving dry air-water vapor mixtures to perform energy and mass balances for the processes;
3. Determine balanced chemical reaction equations and analyze typical combustion processes to perform energy balances to determine the heat transfer released or estimate the maximum possible product gas temperature during combustion and use the results of chemical equilibrium analysis to write balanced chemical reaction equations and to perform energy balances for reaction systems;
4. Calculate stagnation properties of high-speed flows and apply these properties for one-dimensional, compressible flow to isentropic flow though nozzles and to the process occurring across a normal shock wave.

Topics covered:

Based on 3 classes per week:

1. Gas power cycles (6) 2. Steam power cycles (8)
3. Refrigeration cycles (3) 4. Ideal gas mixtures and psychrometrics (6)
5. Combustion processes (6) 6. Chemical equilibrium (3)
7. Ideal compressible flow (6) 8. Review and tests (4)

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Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 3 days per week for 50 minute lectures or 2 days per week for 75 minute lectures

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hrs Engineering Topics with significant design. In this course students apply concepts of thermodynamics to solve engineering problems associated with power and refrigeration cycles. The course assignments also provide the opportunity for the students to practice engineering science and design related to the concepts of gas mixtures, psychrometrics, chemical reactions and one-dimensional compressible flow.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	apply principles of math, science and engineering in solving MAE 302 problems
Outcome B	N/A	
Outcome C	Basic	design a thermodynamic cycle or process
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	Major	solve problems using

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		EES software

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 22nd, 2010 (04:28pm)

MAE 305 Syllabus

Course: MAE 305

Credit Hours: 1

Course Title: Mechanical Engineering Laboratory

Course Description:

Theory and practice of measurement and experimental data collection. Laboratory evaluation and demonstration of components of the generalized measurement system and their effects on the final result. Applications of basic methods of data analysis as well as basic instrumentation for sensing, conditioning and displaying experimental qualities. (Instruction and practice in technical report writing.)

Prerequisite(s): C- or better in MAE 208 and CE 215

Textbook(s) and/or other required material:

Holman, J. P., Experimental Methods for Engineers, 7th Edition, McGraw-Hill, Inc., New York, 2001.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

This course introduces the students to instrumentation system and basic components of solid mechanics. Through MAE 305 the student will be able to:
1. Statistically verify recorded data;
2. Use mechanical measuring devices;
3. Recognize basic components in an instrumentation system;
4. Build simple signal conditioners from basic electronic components;
5. Understand basic concepts such as deflection, stress, strain and their measurements;

Topics covered:

1. Data Analysis 6. Torsion Testing
2. Mechanical Measurements 7. Beam Bending
3. Electronic Systems 8. Strain Gage Installation
4. Amplifiers 9. Cantilever Flexure
5. Active Filters 10. Stress-strain Profile

Class/laboratory schedule (sessions per week and duration of each session):

10 weeks per semester, classes meet 1 day per week for 3 hours.

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

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Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

1 hr. Engineering Topics. This course is designed to provide the basic techniques for evaluating experimental data. Mechanical and electronic measuring devices are introduced. Basic concepts in solid mechanics such as for torsion, transverse beam deflection and pressure vessels are verified.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	Major	Conduct and report results found from experiments.
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	Major	Submit individual formal report.
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 22nd, 2010 (04:31pm)

MAE 306 Syllabus

Course: MAE 306

Credit Hours: 1

Course Title: Mechanical Engineering Laboratory II

Course Description:

Continuation of MAE 305 into specific types of measurements. Students evaluate and compare different types of instrumentation for measuring the same physical quantity on the basis of cost, time required, accuracy, etc. (Oral and written presentation of technical material).

Prerequisite(s): MAE 305 Co-req MAE 310

Textbook(s) and/or other required material:

Holman, J. P., Experimental Methods for Engineers, 7th Edition, McGraw-Hill, Inc., New York, 2001.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

This course introduces the students to the appropriate measurement techniques for different thermodynamic/fluid mechanic systems. Through MAE 306 the student will be able to:
1. Calibrate several measuring devices;
2. Interpret the collected data;
3. Evaluate the efficiency of systems;
4. Understand the basic laws of thermodynamics/fluid mechanics;

Topics covered:

1. Pressure Measurements 6. Viscosity Measurements
2. Air Velocity and Mass Flow Measurements 7. Friction in Fluid Flow
3. Flow Metering 8. Heat Exchanger Analysis
4. Temperature Measurements 9. Pump and Turbine Analysis
5. Thermal Conductivity Measurements 10. Design of experiment

Class/laboratory schedule (sessions per week and duration of each session):

10 weeks per semester, classes meet 1 day per week for 3 hours.

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

MAE 306 Syllabus

1hr. Engineering Topics. This course is designed to provide the students basic concepts in compressible, incompressible flows. Properties such as temperature, viscosity are measured using different types of devices. Results from processes for equipment such as a pump, turbine, double-pipe heat exchanger and wind tunnel are verified. Each student gives an oral presentation on the experiments previously conducted or on current technology.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	Major	Conduct and report results found from experiments.
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (09:01am)

MAE 308 Syllabus

Course: MAE 308

Credit Hours: 3

Course Title: Fluid Mechanics

Course Description:

Development of the basic equations of fluid mechanics in general and specialized form. Application to a variety of topics including fluid statics; inviscid, incompressible fluid flow; design of fluid dynamic system.

Prerequisite(s): MA 242; MAE 208 with a grade of C- or better or CE 215 or mae 208; Corequisites: MA 341 OR MAE 301AND MAE 301 OR MSE 301

Textbook(s) and/or other required material:

Munson, B.R., Young, D.F., Okiishi, T.H., and Huebsch, W.W.,Fundamentals of Fluid Mechanics, 6th ed., Wiley, 2009.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

Through the study of MAE 308 the student will be able to: 1. Give operational definitions of Newtonian and non-Newtonian fluids, Lagrangian and Eulerian methods of describing fluid motion, typical units of quantities such as density and surface tension in SI, British Gravitational, and English Engineering systems of units.2. Analyze pressure distributions in static fluids, determine the hydrostatic forces and their lines of action on plane surfaces and curved surfaces, apply the laws of buoyancy and determine the stability of floating bodies, calculate pressure distributions in incompressible fluids subjected to uniform linear acceleration and rigid body rotation. 3. Develop integral relations for conservation of mass, linear momentum, angular momentum, and energy, solve flow problems and calculate forces for inertial control volumes and for control volumes with rectilinear acceleration, apply the angular momentum principle to fixed and rotating control volumes, develop the Bernoulli equation for a differential control volume, and apply the conservation of energy principle to non-deformable control volumes.4. Develop differential equations for conservation of mass, momentum, and energy, and simplify the equations by introducing stream functions and velocity potentials, solve the differential equations for some plane potential flows and for some 1-dimensional viscous flows.5. Apply the Buckingham p theorem to systematically develop appropriate dimensionless ratios to characterize physical problems, predict prototype behavior from model test results, obtain dimensionless coefficients by normalizing differential equations, and work problems involving variables such as Reynolds number, Mach number, and drag coefficient.6. Determine conditions for which internal flows will be turbulent, solve the equations of motion for fully developed laminar flow in a pipe, use a Moody chart to determine the friction factor, evaluate minor losses in pipe systems, predict pressure losses in non-circular ducts, and evaluate fluid meters for specific applications.7. Develop the boundary layer equations for external flows and apply the solutions to these equations to flow over a flat plate, predict flow separation, and determine the drag and lift forces on bodies.8. Evaluate the performance of fluid machines from measured data, and use non-dimensional parameters to scale the performance as the size, speed, or operating

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conditions change, develop and apply system resistance curves to determine operating conditions, use manufacturers data to specify pumps and fans for use in specific applications.

Topics covered:

Topics (Number of classes), Based on 3 classes per week: Fundamental Concepts(2), Fluid Statics (7) , Integral Relations for Control Volumes(9), Differential Relations (5), Dimensional Analysis (4) 6. Viscous Flow in Ducts (7), External Viscous Flow (3), Fluid Machinery (2), Review and Tests (3).

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 3 days per week for 50 minute lectures or 2 days per week for 75 minute lectures.

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

This course prepares students to design experiments and fluid machinery in senior level capstone courses through the study of basic principles, dimensional analysis, similarity rules, experimental techniques, and instrumentation.3 hrs, Engineering Science.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	apply basic principles to develop differential equations and integral formulations for control volumes, simplify and solve the equations, know when there is a need for experiments.
Outcome B	N/A	
Outcome C	N/A	

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome D	N/A	
Outcome E	Major	identify, formulate, and solve engineering problems by means of analyses and by application of experimental results
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (09:04am)

MAE 310 Syllabus

Course: MAE 310

Credit Hours: 3

Course Title: Heat Transfer Fundamentals

Course Description:

Analysis of steady state and transient one and multi-dimensional heat conduction employing both analytical methods and numerical techniques. Integration of principles and concepts of thermodynamics and fluid mechanics to the development of practical convective heat transfer relations relevant to mechanical engineers. Heat transfer by the mechanism of radiation heat transfer.

Prerequisite(s): MA 301 OR MA 341, C- or better in MAE 301

Textbook(s) and/or other required material:

Incropera, DeWitt, Bergman & Lavine, of Heat and Mass Transfer, 6th ed., J. Wiley, 2007.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 310 through their mastery of the following course objectives. Through the study of MAE 310 the student will be able to:

1. Determine surface temperature or heat rate by performing control surface or control volume energy balances;
2. Calculate heat rate using Fourier's law, Newton's law of cooling, and the Stefan-Boltzmann law;
3. Determine the steady-state temperature distributions in 1-D, constant property solids;
4. Calculate interface temperatures, and or, heat rates for 1-D steady state heat transfer problems using the electrical resistance circuit analogy;
5. Determine the temperature distribution, heat rate, and performance of 1-D fins;
6. Determine 2D steady-state temperature distributions using separation of variables and finite difference techniques;
7. Determine 1D transient temperature distributions using separation of variables and finite difference techniques;
8. Determine 3D transient temperature distributions using the product solution technique;
9. Determine the total and spectral blackbody emissive powers, surface radiation properties and radiation view factors;
10. Calculate surface temperature or heat rate of gray diffuse surface enclosures.

Topics covered:

1. Rate equations, energy balances (4)
2. Heat conduction equation and BCs (4)
3. 1D SS heat conduction & fins (7)
4. 2D steady state heat conduction (6)

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5. 1D transient heat conduction (5)
6. 3D transient heat conduction & FD (3)
7. Radiation heat transfer (10)
8. Review and tests (3)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 3 days per week for 50 minute lectures or 2 days per week for 75 minute lectures

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

1 hr, Mathematics.

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

2 hrs, Engineering Topics.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	Major	***FILL IN
Outcome D	N/A	
Outcome E	N/A	
Outcome F	Major	Demonstrate effective solution procedures to communicate solutions to engineering problems.
Outcome G	N/A	
Outcome H	Major	***FILL IN
Outcome I	Major	Identify, formulate, and solve engineering problems associated with heat conduction,

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		fins, radiation heat transfer to determine surface temperatures and/or heat rates.
Outcome J	Major	***FILL IN
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (09:33am)

MAE 314 Syllabus

Course: MAE 314

Credit Hours: 3

Course Title: Solid Mechanics

Course Description:

Concepts and theories of internal force, stress, strain, and strength of structural element under static loading conditions. Constitutive behavior for linear elastic structures. Deflection and stress analysis procedures for bars, beams, and shafts. Stability of columns.

Prerequisite(s): MA 242 with a grade of C- or better MAE 206 or CE 214; Co requisite: MSE 200, MSE 201, BME 203 or BAE 315

Textbook(s) and/or other required material:

Craig, R.R., Mechanics of Materials, 2nd ed., Wiley

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 314 through their mastery of the following course objectives. Through the study of MAE 314 the student will be able to:

1. Apply linear elastic material laws to calculate deformations of deformable bodies;
2. Integrate deformable body concepts with static equilibrium to solve statically indeterminate problems;
3. Model simple beams;
4. Design a structural component including the concept of factor of safety;
5. Interpret two dimensional stresses and strains using coordinate transformations;
6. Calculate maximum normal/shear stresses and strains;
7. Model thin walled pressure vessels.

Topics covered:

1. Introduction to Solid Mechanics (1) 7. Deflection of Beams (3)
2. Tension, Compression and Shear (3) 8. Analysis of Stress and Strain (3)
3. Axially Loaded Members (3) 9. Pressure Vessels (2)
4. Torsion (2) 10. Column Analysis (1)
5. Advanced Shear Force, Bending Moments (5) 11. Exams (2)
6. Stresses in Beams (3)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 2 days per week for 75 minute lectures (or 3 days per week for 50 minute lectures)

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

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Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

This course is designed to provide the student engineering practice in the theories of stress, strain and strength of structural elements. Extensive analysis procedures are practiced to determine the deflection and stress for bars, beams, and shafts.3hrs, Engineering Science.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Solve ordinary differential equations and solve problems in the area of solid mechanics, vector algebra
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (09:35am)

MAE 315 Syllabus

Course: MAE 315

Credit Hours: 3

Course Title: Dynamics of Machines

Course Description:

Introduction to mechanical vibration, free and forced responses of discrete and continuous systems. Application of vibrations to the analysis and design of machine and mechanical components.

Prerequisite(s): MA 341, C- or better in MAE 208 and CE 215.

Textbook(s) and/or other required material:

Rao, S., Mechanical Vibrations, fourth Edition, Addison-Wesley, 2004.
Supplemental materials.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 315 through their mastery of the following course objectives. Through the study of MAE 315 the student will be able to:
1. Analyze and develop single degree-of-freedom vibration models of physical systems, predict the system's natural frequency, and calculate the forced vibration response to harmonic input forces;
2. Perform basic natural frequency analysis for two degree-of-freedom systems, and for one-dimensional continuous systems;
3. Calculate the kinematic response variables for planar mechanism such as linkages. Determine the dynamic forces arising in a mechanism due to the motion of the system components. Predict the dynamic motion of a mechanism that results from a set of applied forces;
4. Determine the mass corrections to be added to or subtracted from a planar mechanism in order to achieve a state of dynamic balance.

Topics covered:

1. Single degree-of-freedom systems (13)
2. Multi degree-of-freedom systems (7)
3. Continuous systems (3)
4. Machinery kinematics (2)
5. Dynamic forces, balance (1)
6. Review and tests (3)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 2 days per week for 75 minute lectures or 3 days per week for 50 minute lectures

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Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

This course requires homework assignments that involve both design analysis of vibration models of physical systems and open-ended design problems where students must make choices for parameters controlling the kinematic and dynamic response variables for planar mechanisms such as linkages.3 hrs, Engineering Topics with significant design.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	Apply principles of math, science and engineering in solving MAE 315 problems. Apply principles to the solution of ordinary and partial differential equations. Apply principles of matrix analysis for multiple degree-of-freedom systems and for dynamic force calculations.
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	Major	Solve problems using EES software.
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome I	N/A	
Outcome J	N/A	
Outcome K	Major	Identify, formulate and solve engineering problems associated with mechanical vibrations, gear trains, and machinery force determination.Apply principles of physics, statics and dynamics in solving MAE 315 problems.

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (09:35am)

MAE 316 Syllabus

Course: MAE 316

Credit Hours: 3

Course Title: Strength of Mechanical Components

Course Description:

Analysis and design of mechanical components based on deflection, material, static strength and fatigue requirements. Typical components include beams, shafts, pressure vessels, and bolted and welded joints. Classical and modern analysis and design techniques. Computer analysis using the finite element method. Material and manufacturing considerations in design.

Prerequisite(s): C- or better in MAE 314 or CE 313

Textbook(s) and/or other required material:

Ugural, et. al, Mechanical Design- An Integrated Approach, McGraw-Hill, 2004.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 316 through their mastery of the following course objectives. Through the study of MAE 316 the student will be able to: 1. Perform engineering analysis on basic mechanical components including but not limited to: bars, beams, shafts, thick wall pressure vessels, beams with skew loads and non-symmetric cross sections, curved beams, columns, bolted joints.2. Formulate and solve engineering mechanics problems with advanced techniques such as: Castigliano s theorem matrix methods (finite elements) for beam analysis.3. Perform design analysis on mechanical components using taking into account: failure theories, fatigue analysis, fracture mechanics analysis4. Perform limited design calculations on machine components such as: beams, thick wall pressure vessels, beams with skew loads and non-symmetric cross sections, curved beams, columns, bolted joints.

Topics covered:

1. Bars, beams, shafts, combined stress (3) 2. Principal stress in 2D and 3D (2) 3. Design of thick wall pressure vessels (2) 4. Press and shrink fits (2)5. Contact stress (2) 6. Beams with skew loads (2)7. Beams with nonsymmetric cross sections (3) 8. Design of curved beams (2)9. Castigliano s theorem (3) 10. Matrix methods for beam analysis (3)11. Column design (2) 12. Failure theories (2)13. Stress concentration (2) 14. Fatigue analysis (4)15. Fracture mechanics (1) 16. Design of bolted, welded joints (2)17. Review sessions and exams (4)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 3 days per week for 50 minute lectures or 2 days per week for 75 minute lectures

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

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Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hrs Engineering Topics with significant design.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	Intermediate	Design engineering components with particular emphasis on beams, thick wall pressure vessels, beams with skew loads and non-symmetric cross sections, curved beams, columns, bolted joints.Identify, formulate, and solve engineering problems associated with bars, beams, shafts thick wall pressure vessels, beams with skew loads and non-symmetric cross sections, curved beams, columns, bolted joints.Apply principles of statics, dynamics, solid mechanics, and materials science in solving MAE 316 design problems.
Outcome D	N/A	
Outcome E	N/A	

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (09:36am)

MAE 403 Syllabus

Course: MAE 403

Credit Hours: 3

Course Title: Air Conditioning

Course Description:

Design of a complete air conditioning system for a building. Introduction, Design Objectives - Building Description, Review of Psychrometrics and Air Conditioning Processes, Cooling and Heating Load Calculation, Space Air diffusion, Duct Lay-out and Design, Equipment Selection, Pipe Sizing, Life-cycle Cost Analysis.

Prerequisite(s): MAE 302, MAE 308, MAE 310

Textbook(s) and/or other required material:

Principles of Heating, Ventilating, and Air Conditioning; Howell, Sauer, and Coad; American Society of Heating, Refrigerating, and Air-Conditioning Engineers, 2005

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

At the end of the course students will be able to:
1. Calculate the cooling and heating load for a building
2. Determine the necessary air flow rate to be delivered to the several different rooms in the building
3. Select the appropriate air diffusing equipment (diffusers, grilles, etc.)
4. Lay out and design the duct system
5. Select the adequate equipment to supply and condition the air from a manufacturer's catalog
6. Estimate the energy consumption of the whole system and its life cycle cost.

Topics covered:

(based on twice a week schedule) Lectures
1. Introduction, design objective - building description. 1
2. Air Conditioning Systems and Equipment 2
3. Moist Air Properties and Conditioning Processes 4
4. Comfort and Health and Indoor Environmental Quality 2
5. Heat Transmission in Building Structures 1
6. Space Heating Load 1
7. The Cooling Load 4
8. Space Air Distribution 2
9. Fans and Building Air Distribution (Duct Design) 3
10. Flow, Pumps and Piping Design 3
11. Energy Calculations 2
(two lectures are reserved for review and testing)

Class/laboratory schedule (sessions per week and duration of each session):

MAE 403 Syllabus

14 week semesters, classes meet 2 days per week for 75 minutes.

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hrs. Engineering Topics with Design. Through homework assignments and design projects students acquire the skills necessary to calculate building heat and cooling loads, design the duct system to deliver the conditioned air to a building, design the chilled water and condensing water systems, select equipment from manufacturer's catalog and develop the life cycle cost analysis for the whole system.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (09:38am)

MAE 406 Syllabus

Course: MAE 406

Credit Hours: 3

Course Title: Energy Conservation in Industry

Course Description:

Application of energy conservation principles to a broad range of industrial situations with emphasis on typical equipment encountered as well as the effect of recent environmental regulations. Topics covered include: steam generators, pollution control, work minimization, heat recovery, compressed air, HVAC, industrial ventilation, electrical energy management, and economics. Field trip to conduct tests and evaluate operation at three NCSU steam plants.

Prerequisite(s): MAE 302, MAE 310

Textbook(s) and/or other required material:

Thermodynamics and heat transfer texts as used in pre-requisite courses. Currently they are:
Thermodynamics, Cengel and Boles, McGraw-Hill, 2002
Introduction to Heat Transfer Incropera and DeWitt, Wiley, 2002

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

This course will analyze practical aspects of energy consumption in industry and current conservation strategies. We will look at major energy consuming equipment in manufacturing plants and determine how these devices operate, their purpose in the manufacturing process, and develop strategies that can be applied to reduce cost of operation. The students will be asked to demonstrate their knowledge of the material covered in MAE 406 through their mastery of the following course objectives. Through the study of MAE 406 the student will be able to:
1. Describe the purpose and workings of typical energy consuming equipment found in manufacturing plants. Equipment such as steam generators, steam traps, air compressors, pollution control equipment, recovery heat exchangers, electric motors, industrial lighting, air-conditioning, and ventilation equipment.
2. Describe the issues concerning energy conservation, waste recovery, energy management and economic trade-off.
3. Calculate and analyze performance of steam generators, steam traps, pollution control equipment, recovery heat exchangers, air compressors and ventilation equipment.
4. Evaluate strategies for reducing energy use and the cost of operation of industrial systems.
5. Conduct tests, calculate performance and evaluate system operation in a field setting.

Topics covered:

Based on 2 classes per week:
1. Steam Generating Systems (2) 2. Waste Heat Recovery & Steam Traps (2)
3. Emissions, Pollutants, Air Permitting (4) 4. Plant tour-boiler efficiency test (2)
5. Electrical Energy Management (2) 6. Air compressors and air equipment (2)
7. Electric motors, industrial lighting (2) 8. Heating, Ventilation, Air Condit. (2)

MAE 406 Syllabus

9. Pumps, piping fans and ducts (2) 10. Plant tour of mechanical room (2)
11. Electrotechnologies (2) 12 Other industrial processes (2)
13. Quizzes (2)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 2 days per week for 75 minute lectures or 1 day a week for 150 minutes.

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

: 3 hrs Engineering Topics with significant design. Students are exposed to field testing of equipment, learn best practices for energy use and become familiar with numerous codes and permitting requirements. Students learn to balance realistic economic analysis with concepts of energy conservation and environmental impact.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (01:11pm)

MAE 407 Syllabus

Course: MAE 407

Credit Hours: 0

Course Title:

Course Description:

Prerequisite(s): MAE 302 AND MAE 308 OR MAE 355

Textbook(s) and/or other required material:

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

Topics covered:

Class/laboratory schedule (sessions per week and duration of each session):

Contribution of course to meeting the requirements of Criterion 5 - other:

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

Contribution of course to meeting the requirements of Criterion 5 - general education:

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (09:41am)

MAE 408 Syllabus

Course: MAE 408

Credit Hours: 3

Course Title: Internal Combustion Engine Fundamentals

Course Description:

Fundamentals common to internal combustion engine cycles of operation. Otto engine: carburetion, combustion, knock, exhaust emissions and engine characteristics. Diesel engine: fuel metering, combustion, knock, and performance. Conventional and alternative fuels used in internal combustion engines.

Prerequisite(s): MAE 302

Textbook(s) and/or other required material:

Willard W. Pulkrabek, Engineering Fundamentals of the Internal Combustion Engines, Pearson Prentice Hall Publishing, second edition, 2003.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

This course is designed to give seniors in mechanical engineering a better understanding of the basic knowledge of internal combustion engines and their emissions. Upon completing this course the student will be able to:
List the different cycles used in ICE and recite their practical limitations and performance characteristics.
Explain the combustion process in gasoline and diesel engines
Calculate the performance characteristics of ICE.
Analyse the emission characteristics of ICE from knowledge of the fuel mixture charges.
Design some engine components such as the intake and exhaust valve diameters and runners.

Topics covered:

a- Internal Combustion Engines structure and Performance Characteristics (7)
b- Engine Cycle Analysis (3)
c- Fuel Chemistry and fuels property (3)
d- Air Induction (1)
e- Fuel Metering in ICE (2)
f- Combustion in ICE (5)
g- Exhaust Emission characteristics of ICE and control (4)
h- Bio-diesel combustion (1)

Class/laboratory schedule (sessions per week and duration of each session):

26 lectures, 3 exams (14 weeks), 2 days per week, 75. minute lectures

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

MAE 408 Syllabus

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

2 hr, Engineering Science and , 1 hour design. Comment on the relation to the program Criteria 4, professional, outcomes. That is what is done in this course to further the students knowledge of math and basic science, engineering science and design as related to the outcomes in item 9 below. Students will learn about fundamental and technological advances in internal combustion engines.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (01:12pm)

MAE 412 Syllabus

Course: MAE 412

Credit Hours: 3

Course Title: Analysis and Design of Energy Systems

Course Description:

Applications of thermodynamics, fluid mechanics, and heat transfer to thermal systems with an emphasis on system design and optimization. Design of heat exchangers. Analysis of engineering economics, including time value of money, present and future worth, payback period, internal rates of return, and cost benefit analysis. Review of component models for pipes, pumps, fans, compressors, turbines, evaporators, condensers and refrigerators. Simulation methods for finding the operating point for thermal systems. Design of thermal systems through optimization.

Prerequisite(s): MAE 302, MAE 308, and MAE 310

Textbook(s) and/or other required material:

White, Fluid Mechanics, 5th ed.
Incropera and DeWitt, Fundamentals of Heat and Mass Transfer, 6th ed.
Cengel and Boles, Thermodynamics, 6th ed.
Notes provided for engineering economics

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 412 through their mastery of the following course objectives. Through the study of MAE 412 the student will be able to:
1. Calculate the performance of parallel, counter and cross flow heat exchangers using both the log mean temperature difference and the effectiveness-number of transfer units methods of analysis and analyze the performance characteristics of a number of components in thermal and energy systems including (but not limited to) heat exchangers, condensers, evaporators, pumps, fans, pipes and ducts.
2. Calculate and analyze system performance of multiple thermal components joined together using graphical techniques, analytical simulation techniques solving simultaneous equations, and numerical techniques approximately solving simultaneous equations.
3. Evaluate the economic viability of projects using methods based on the time value of money including techniques such as life-cycle costing, payback period, and internal rate of return.
4. Design thermal systems using methods of repeated simulation and analytical optimization tools.
5. Communicate the results to group project work through formal report writing and oral presentations.

Topics covered:

Based on two classes per week:
1. Methods of design (1)

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2. Heat exchangers (5)
3. Thermal components (pipes and ducts) (2)
4. Turbomachinery (2)
5. Thermal systems analysis (4)
6. Engineering economics (5)
7. Thermal system optimization (2)
8. Tests, team project and presentations (7)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 3 days per week for 50 minute lectures or 2 days per week for 75 minute lectures

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hrs Engineering Topics with significant design; Students have homework assignments to be done individually and also work in teams to complete a required major thermal system design project. Students present the results orally and in final report format. Student teams develop an economic evaluation of the trade-off between capital investment and lifecycle savings, and discuss the practical issues affecting the design.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	Major	design thermal and energy systems (multiple components together) using simulation and optimization methods.
Outcome D	Major	Work in teams on a major project involving

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		simulation, optimization, and economic analysis, and present results (report, oral presentation) as a team
Outcome E	Major	identify, formulate, and solve engineering problems associated with heat exchangers, pumps, fans and engineering economics
Outcome F	Major	***FILL IN
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	Major	Solve simulation and optimization problems using modern software tools such as MATLAB, MAPLE, and EXCEL. Assess viability of project using tools of engineering economics.

Person who last prepared this description and date of preparation:

- Johnson, Richard R. (rrj) - Oct 25th, 2011 (02:22pm)

MAE 415 Syllabus

Course: MAE 415

Credit Hours: 3

Course Title: Analysis for Mechanical Engineering Design

Course Description:

Integration of the physical sciences, mathematics, and engineering to solve real-world design problems. Emphasis on open-ended problems which contain superfluous information and/or insufficient data. Solution techniques focus on problem definition, reduction to a solvable system, and development of a design response. Formal written communication of results.

Prerequisite(s): MAE 315 and MAE 316 or MAE 371

Textbook(s) and/or other required material:

Budynas and Nisbett, Shigley's Mechanical Engineering Design, 8th Edition, McGraw Hill.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The students will be asked to demonstrate their knowledge of the material covered in MAE 415 through their mastery of the following course objectives. Through the study of MAE 415 the student will be able to:

1. Design basic mechanical components including but not limited to: bolted joints, weldments, springs, rolling contact bearings, journal bearings, gears, brakes, clutches, flexible drive elements, shafts, and axles. Find essential information for design purposes from WorldWideWeb sites of manufacturers and suppliers.
2. Integrate background developed in the physical sciences, engineering sciences and mathematics to solve real world design problems. Solve open-ended problems that contain superfluous or insufficient information and require development of additional data for analysis.
3. Create technical reports that describe the context and significance of a design problem, and the procedures/methods used to solve the problem.

Topics covered:

Based on 3 classes per week:

1. Design of bolted joints (3) 2. Design of weldments (3)
3. Design of springs (4) 4. Design of rolling contact bearings (4)
5. Design of journal bearings (3) 6. Design of gears (5)
7. Design of brakes and clutches (5) 8. Design of flexible drive elements (5)
9. Design of shafts and axles (6) 10. Reporting and presentations (2)
11. Review and tests (2)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 3 days per week for 50 minute lectures or 2 days per week for 75 minute lectures

MAE 415 Syllabus

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hrs Engineering Topics with significant design. Students working in teams are required to complete three design projects from problem definition to design drawings and calculations. In the design the students will address some of the issues of economics, environmental, sustainability, manufacturability, ethical, health and safety, social and political. Written reports are required for each project.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Basic	apply principles of math, science and engineering in solving MAE 415 problems
Outcome B	N/A	
Outcome C	Major	design engineering systems with particular focus on components including fasteners, welds, springs, rolling contact bearings, journal bearings, gears, brakes, clutches, flexible drive elements, shafts, and axles.
Outcome D	Major	work on teams to accomplish goals of several significant design projects
Outcome E	N/A	
Outcome F	N/A	

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome G	Major	demonstrate effective solution procedures and communicate solutions to engineering problems by written reports
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	Major	use computer aided analysis and design tools to implement design approaches developed in class, use WWW to gather information for design projects

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (01:10pm)

MAE 416 Syllabus

Course: MAE 416

Credit Hours: 4

Course Title: Mechanical Engineering Design

Course Description:

: Teamwork, independent learning and communication skills are emphasized in this capstone course. Teams of students experience mechanical engineering design through: problem definition, investigation, brainstorming, focus, critical review, design, analysis, prototype construction and testing. Design for manufacture is encouraged throughout the process by having students build their own prototypes. Communication skills are developed through reports and presentations.

Prerequisite(s): MAE 415

Textbook(s) and/or other required material:

No text is required.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

This course emphasizes teamwork. Eighty five percent of the grade a student receives has to do with the team s performance and the individual s participation in the team. After completing this course, students should be able to:

1. Investigate an engineering problem and define goals and objectives for its solution.
2. Create and maintain an engineering journal.
3. Demonstrate independent learning skills by devising and investigating feasible ideas.
4. Demonstrate the ability to work in teams through peer reviews.
5. Communicate technical information.
6. Understand mechanical engineering design and analysis techniques.
7. Demonstrate proficiency in creating and understanding design / manufacturing drawings.
8. Demonstrate proficiency in using state of the art software & other electronic tools.
9. Budget and schedule a project.
10. Optimize a design.
11. Fabricate a prototype.
12. Improve a design through testing and modification

Topics covered:

1. Team assignments (1) 11. Statistics and Report guidelines (1)
2. Problem introduction (1) 12. Critical design review* (1)
3. Problem definition (1) 13. Economics and Cost (1)
4. Feasible ideas (1) 14. Legal and Ethical issues (1)
5. Presentation guidelines (1) 15. Prepare design drawings (1)
6. Preliminary design review* (1) 16. Detailed design review* (1)

MAE 416 Syllabus

7. Focus feasible ideas (1) 17. Machining, welding & fabrication (10)
8. Analysis (1) 18. Testing* (1)
9. Material Selection (1) 19. Debugging (1)
10. Design for Manufacture (1) 20. Final Presentations* (1)

* Student Presentation

Class/laboratory schedule (sessions per week and duration of each session):

13 lectures, 5 student presentations, 11 labs (14 weeks), 2 days per week, 75 minute lectures

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

4 hrs Engineering Topics with significant design. Students working in teams are required to complete a design project from problem definition to prototype construction, testing and delivery to the client. In the design the students will address some of the issues of economics, environmental, sustainability, manufacturability, ethical, health and safety, social and political. Oral and written reports are required throughout the project.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	Major	Integrate factors of safety, strength of engineering materials and use this information to design simple components
Outcome D	Major	Work as a team
Outcome E	N/A	
Outcome F	Basic	Integrate ethical principles relating to

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		the project and its sponsor
Outcome G	Major	Present their ideas clearly through reports and presentations
Outcome H	Basic	Define how their project impacts society
Outcome I	Basic	Apply a systematic and structured approach to problem solving
Outcome J	Basic	Work on a contemporary project
Outcome K	Basic	Apply a systematic and structured approach to problem solving

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (01:13pm)

MAE 421 Syllabus

Course: MAE 421

Credit Hours: 3

Course Title: Design of Solar Heating Systems

Course Description:

Analysis and design of active and passive solar thermal systems for residential and small commercial buildings. Solar insolation, flat plate collectors, thermal storage, heat exchangers, controls, design, performance calculations, economics. Site evaluation, shading, suncharts, types of passive systems. Heating load analysis. Overview of photovoltaics. On-site evaluation of NCSU Solar House.

Prerequisite(s): MAE 302, MAE 310

Textbook(s) and/or other required material:

Solar Engineering of Thermal Processes, 2e, Duffie and Beckman, John Wiley & Sons 1991

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The course is intended to provide students with a broad understanding of both the theoretical and practical aspects of designing solar heating systems. For active solar systems the students will learn about solar radiation, solar collectors, thermal storage, hot-water and air-heating systems and develop the skills to size, select and economically assess components for sound system design. Students will learn about passive design and compare the relative merits of approaches such as direct gain, thermal storage walls, and sun spaces, as well as identify architectural features that enhance house energy use. The students will be asked to demonstrate their knowledge of the material covered in MAE 421 through their mastery of the course objectives. Through study of MAE 421 the student will be able to:
Describe the purpose and functional characteristics of the components of active solar heating systems and the features of architectural design commonly used in passive solar.
Describe the issues concerning sustainable energy use and energy management involving economic trade-off.
Calculate and analyze the performance of solar collectors, thermal storage, heat exchangers, solar heating systems, photovoltaic systems, and various architectural features such as direct gain, thermal storage walls, and sun spaces.
Design solar heating systems consistent with energy needs and economic constraints for residential and industrial applications.
Assess practical systems through on-site evaluation of systems at the NCSU Solar House.

Topics covered:

Based on 2 classes per week:
1. Solar radiation Principles & Resources (2) 2. Solar Collectors (2)
3. Thermal Storage & Heat Exchangers (2) 4. Service Hot Water Systems (2)
5. Component selection & controls (2) 6. System Design(f-chart) and economics(2)

MAE 421 Syllabus

7. Solar Industrial Process Heat (2) 8. Site selection, shading, sun chart (2)
9. Direct gain, storage wall, sunspace (2) 10. Load analysis & passiveDesign process (2)
11. Architectural Guidelines (2) 12. Photovoltaic systems (grid & off-grid) (2)
13. Tests (2) 14. On-site at NSCU Solar House (2)

Class/laboratory schedule (sessions per week and duration of each session):

14 week semesters, classes meet 2 days per week for 75 minute lectures or 1 day a week for 150 minutes.

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hrs Engineering Topics with significant design. Students are exposed to site evaluation of many solar heating applications at the NCSSU Solar House. Design of solar heating systems will be according to best practices for energy use and students will become familiar with building codes, permitting requirements and tax rebate arrangements for solar heating systems. Students will learn to balance realistic economic analysis with concepts of sustainable energy use.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	***FILL IN
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (01:14pm)

MAE 435 Syllabus

Course: MAE 435

Credit Hours: 3

Course Title: Principles of Automatic Control

Course Description:

Study of linear feedback control systems using transfer functions. Transient and steady state responses. Stability and dynamic analyses using time response and frequency response techniques. Compensation methods. Classical control theory techniques for determination and modification of the dynamic response of a system. Synthesis and design applications to typical mechanical engineering control systems. Introduction to modern control theory.

Prerequisite(s): MA 341 OR MA 301 AND MAE 315

Textbook(s) and/or other required material:

Franklin, Powell, and Emami-Naeini, Feedback Control of Dynamic Systems, 6th Ed., Pearson, 2009.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The overall objective of the course is to facilitate student s ability to analyze and design control systems for various electromechanical engineering systems. Specifically, the students are required to demonstrate their knowledge and understanding of the course material by:1. Modeling typical electromechanical systems using elementary concepts in machine dynamics and electrical circuits coupled with basic skills in solving linear ordinary differential equations.2. Analyzing theoretical responses of typical electromechanical systems to various forms of commands and to examine their characteristic behavior in terms of stability, performance limits, and sensitivity to parameter changes.3. Predicting and interpreting system behaviors in terms of design goals and constraints along with presence of external disturbances by use of classical control tools such as Root Locus Method and Frequency response techniques4. Designing controllers to modify and improve system behaviors and achieve a desired behavior considering hardware constraints and cost-performance tradeoffs.

Topics covered:

(Number of classes): Based on 3 classes per week: Basic concepts (6), System Modeling (6), Response analysis and stability (6), PID control technique (4), Root Locus Method (6), Frequency Response and Bode plots (8), Lead-lag compensation and applications (4), Tests (2)

Class/laboratory schedule (sessions per week and duration of each session):

Number of sessions each week and duration of each session: 14 week semesters, classes meet 3 days per week for 50 minute lectures or 2 days per week for 75 minute lectures.

Contribution of course to meeting the requirements of Criterion 5 - other:

3 hrs, 1 hour of Engineering Science, 1 hour of Engineering Math, and 1 hour of Design.

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Through this course the students apply differential equations to modeling typical electromechanical systems while using elementary concepts in machine dynamics and electrical circuits and apply the Root Locus Method and Frequency response techniques to predict and interpret system behaviors. Students demonstrate their knowledge of the course through designing controllers.

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

1 hour of Engineering Math.

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

1 hour of Engineering Science and 1 hour of Design.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	Basic	Apply controller design rules and techniques to solve open-ended problems in design project.
Outcome D	N/A	
Outcome E	Major	Solve and analyze electromechanical system problems using dynamics and energy principles.
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	Basic	Solve homework problems and design problems using MatLab/Simulink tools.

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (01:16pm)

MAE 442 Syllabus

Course: MAE 442

Credit Hours: 3

Course Title: Automotive Engineering

Course Description:

Fundamental aspects of automotive engineering. Examines various automotive systems (engine, brakes, etc.) as well as their interactions in such areas as safety and performance. Current practices and development for the future.

Prerequisite(s): MAE 302, MAE 308, MAE 315, MAE 316

Textbook(s) and/or other required material:

No text is required.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

The object of this course is to acquaint the student with the fundamental aspects of automotive engineering. Upon completing this course the student will be able to:
Calculate vehicle performance characteristics
Design some vehicle components such as clutch and brakes.
Determine engine performance characteristics
Describe engine supporting systems such as cooling , ignition , and lubricating systems
List the advantages and disadvantages of the different power drive configurations used in vehicles such as front wheel drive, rear wheel drive , all wheel drive vehicles

Topics covered:

Aerospace, Automobile, Commercial Vehicles and Motor Sports

Class/laboratory schedule (sessions per week and duration of each session):

25 lectures (14 weeks), 4 quizes, 2 days per week, 75 minute lectures

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hr, Engineering Topics with design. Students will learn about fundamentals and technological advances in automotive engineering.

MAE 442 Syllabus

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	N/A	
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	Major	***FILL IN
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (01:19pm)

MAE 469 Syllabus

Course: MAE 469

Credit Hours: 1

Course Title: Controls Laboratory

Course Description:

Laboratory experiments demonstrate the essential features of classical and modern control theory for single-input, single-output systems.

Prerequisite(s): MAE 306 or MAE 261 Co-req MAE 461 or MAE 435

Textbook(s) and/or other required material:

Basic Experiments in Analog Control, L. Silverberg (50 pages);
Lab Session Handouts (50 pages).

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

For most students, the controls laboratory MAE 469 is taken during the same semester as Dynamics and Controls MAE 435. The objective of the controls laboratory MAE 469 is to show how the concepts covered in MAE 461 or MAE 435 are applied. An important part of MAE 469 is directed toward developing the tools and methods in electronics necessary in the application of controls. The students are taught through self-paced, hands-on, experiments that are performed in teams of 3. Through the experiments offered in this course, the students are able to:
1. Experience and perform basic analyses in the areas of dynamics and vibrations. Examine relationships between parameters associated with nutation, precession, and vibration (frequencies, damping rates, externally applied tension, initial conditions, modes of vibration, nodal lines, attenuation, homogeneity, etc.).
2. Experience and perform basic experiments in the areas of analog electronics: Students learn how to analyze, breadboard, and test an analog circuit, build buffers, multipliers, differentiators, integrators, PID controllers, filters, transistors, and motor control.
3. Experience and perform experiments in digital control. Learn about real-time programming, microprocessors, programming a Basic-XTM stamp, how to interface sensors, system design and integration.

Topics covered:

1. Vibrations (1)
2. 3D Dynamic (1)
3. Circuit Analysis (1)
4. Analog Filtering (1)
5. Analog Control (3)
6. Transistors and Motors (2)
7. Microprocessors (3)

Class/laboratory schedule (sessions per week and duration of each session):

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14 week semesters, lab meets 1 day per week, 3 hours per lab

Contribution of course to meeting the requirements of Criterion 5 - other:

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

1 hr, Engineering Topics.
In this course the student learn how to design, build and test various electronic control components. They also receive hands on experience with dynamics and vibration test instrumentation in which they design and conduct the necessary experiments.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	N/A	
Outcome B	Major	perform 14 laboratory experiments
Outcome C	N/A	
Outcome D	N/A	
Outcome E	N/A	
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	N/A	

Person who last prepared this description and date of preparation:

- Crystal Hanson (cmhanso2) - Apr 23rd, 2010 (02:08pm)

MSE 200 Syllabus

Course: MSE 200

Credit Hours: 3

Course Title: Structure and Properties of Engineering Materials

Course Description:

Introduction to the fundamentals that give rise to the wide spectrum of materials of practical use to engineers. Emphasis on the mechanical behavior of materials. The topics covered in this course are extensive, and many new terms and concepts will be presented. You are expected to learn terminology, be able to present concepts and relationships graphically, and apply your knowledge to solve a variety of numerical problems.

Prerequisite(s): CH 101

Textbook(s) and/or other required material:

Fundamentals of Materials Science and Engineering: An Introduction, 7th ed., W.J. Callister, Jr., Wiley & Sons, 2007.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

1) Explain relationships between atomic bonding and atomic structure of materials, 2) Explain relationships between the atomic and microscopic level structure of materials and their mechanical and physical properties,3) Select materials for applications based on performance and failure modes, 4)Design the processing of a material to achieve a desired set of properties

Topics covered:

Atomic structure, bonding and material properties
Atomic structures of crystalline materials
Defects in crystalline materials
Diffusion in solids
Mechanical properties of materials
Strengthening mechanisms for materials
Failure mechanisms
Phase diagrams & Phase transformations
Processing of metal alloys
Structures and properties of ceramics
Structures and mechanical properties of polymers
Composite materials and properties

Class/laboratory schedule (sessions per week and duration of each session):

Two 75-minute or three 50-minute sessions per week

Contribution of course to meeting the requirements of Criterion 5 - other:

MSE 200 Syllabus

N/A

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

N/A

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hours engineering topics - introductory coverage of crystallography, phase diagrams, mechanical properties of materials.

Contribution of course to meeting the requirements of Criterion 5 - general education:

N/A

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Describe the periodic table, chemical bonding, electronic band structure in solids, electrical and magnetic principles, stress/strain principles, structure-property relationships in metals, ceramics, polymers and composites.
Outcome B	Major	Analyze and compare mechanical testing data for metals, ceramics and polymers, including stress-strain, hardness, fatigue, fracture, creep and impact tests.
Outcome C	N/A	
Outcome D	N/A	
Outcome E	Intermediate	Solve elementary problems in mechanical behavior and fracture mechanics, microstructural design

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		of alloys from phase diagrams and kinetic considerations
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	N/A	
Outcome J	N/A	
Outcome K	Major	Describe mechanical testing procedures such as tensile, creep, hardness, fatigue and impact tests, describe the properties obtained from these tests and relate them to specific applications. Use phase diagrams to determine qualitatively and quantitatively the microstructural development which occurs during the processing of selected materials and relate that microstructure to properties such as strength and ductility.

Person who last prepared this description and date of preparation:

- Raubenheimer, Dr. Dianne Carol (cdrauben) - Feb 26th, 2010 (10:42am)