LONG SIGNATURE SHEET

UNC CHARLOTTE

Proposal Number: ET 4-19-12

Proposal Title: Revision of Four-Year Mechanical Engineering Technology Undergraduate Curriculum

Originating Department: Engineering Technology

TYPE OF PROPOSAL: UNDERGRADUATE__X__ GRADUATE_____

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
	4/20/12	4/20/2012	*Approved*	**DEPARTMENT CHAIR** Anthony Brizendine
4/20/2012	5/7/2012	5/8/2012	*Approved*	**COLLEGE CURRICULUM COMMITTEE CH** Bruce Gehrig
10/30/12	10/30/12	10/30/12	*Approved*	**COLLEGE FACULTY CHAIR (if applicab** ~~Martin Kane~~ Jeff Kimble
11/5/12	11/6/12	11/6/12	*Approved*	**COLLEGE DEAN** Robert Johnson
			Approved	**GENERAL EDUCATION** (for General Education courses)
11/9/12	6/Dec/12	6/Dec/12	*Approved*	**UNDERGRADUATE COURSE & CURRIC COMMITTEE CHAIR** (for undergraduate courses)
			Approved	**GRADUATE COUNCIL CHAIR** (for graduate courses)
			Approved	**FACULTY GOVERNANCE ASSISTANT** (Faculty Council approval on Consent Cal
				FACULTY EXECUTIVE COMMITTEE (if decision is appealed)

Revised 08/01/11
OAA/lz

LONG SIGNATURE SHEET

Proposal Number: ET 4-19-12

Proposal Title: Revision of Four-Year Mechanical Engineering Technology Undergraduate Curriculum

Originating Department: Engineering Technology

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			Approved	**COLLEGE CURRICULUM COMMITTEE CHAI** Bruce Gehrig
			Approved	**COLLEGE FACULTY CHAIR (if applicable)** Martin Kane
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			Approved	**GENERAL EDUCATION** (for General Education courses)
			Approved	**UNDERGRADUATE COURSE & CURRICUL COMMITTEE CHAIR (**for undergraduate courses)
			Approved	**GRADUATE COUNCIL CHAIR** **(**for graduate courses)
			Approved	**FACULTY GOVERNANCE ASSISTANT** (Faculty Council approval on Consent Calend
				FACULTY EXECUTIVE COMMITTEE (if decision is appealed)

Revised 08/01/11
OAA/lz

UNC CHARLOTTE

LONG FORM

COURSE AND CURRICULUM PROPOSAL

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*To: Bruce Gehrig

From: Nan A. Byars

Date: April 20, 2012

Re: Revision of Four-Year Mechanical Engineering Technology Undergraduate Curriculum

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Attached please find a proposal to revise the undergraduate curriculum of the Mechanical Engineering Technology program.

Revised Undergraduate Course and Curriculum Proposal

Department of Engineering Technology

Revision of Four-Year Mechanical Engineering Technology Undergraduate Curriculum

A. PROPOSAL SUMMARY AND CATALOG COPY

1. Summary.

The Department of Engineering Technology proposes to modify the mechanical engineering technology curriculum to meet current trends and state of practice. This proposal eliminates five undergraduate courses and one laboratory course, while adding four new undergraduate lecture courses, two of which have an associated laboratory, a laboratory, and a one hour seminar. The proposed changes in the Mechanical Engineering Technology program are as follows:

- New required courses will be:

  ETGR 1100L Engineering Technology Computer Applications Lab
  ETGR 3295 Multidisciplinary Professional Development
  ETME 1111 CAD Modeling 1
  ETME 2100 Sophomore Design Practicum
  ETME 2100L Sophomore Design Practicum Laboratory
  ETME 3100 Junior Design Practicum
  ETME 3100L Junior Design Practicum Laboratory
  ETME 3150 Applied CAD Modeling & Simulation

- Eliminated undergraduate courses are:

  ETGR 1100 Engineering Technology Computer Applications
  ETGR 1103 Technical Drawing 1
  ETME 2202 Introduction to Parametric Modeling
  ETGR 3272 Numerical Methods
  ETME 2156 Machine Shop Practices
  ETME 2156L Machine Shop Practices Lab

As part of this curriculum revision proposal, a concentration in energy will be added. Students will have an option to take existing energy-related courses for their four major elective courses to satisfy the new energy concentration.

Changes will be made to some course numbers, titles, and descriptions to reflect a consistent numbering and notation for the new program sequence. Some courses include revised course pre/co-requisites or additional limitations and requirements, which are provided in this document. Overall, the BSET Mechanical Engineering Technology program requirements have increased from 124 credits to 128 credits. The changes outlined in this proposal are structured to meet minimum curriculum requirements for TAC of ABET accreditation. Course numbering and/or course titles will be modified for the existing courses as follows:

Revised Course Number	Former Course Number	Revised Course Name	Former Course Name

ETME 1112	ETME 1104	CAD Modeling 2	Technical Drawing 2
ETME 2130	ETME 1101	Materials & Manufacturing 1	Manufacturing Processes
ETME 2131	ETME 2101	Materials & Manufacturing 2	Applied Materials
ETME 3123L	ETME 3152	Stress Analysis Lab	same
ETME 4143L	ETME 3252	Thermodynamics & Heat Transfer Lab	same
ETME 3133L	ETME 3151	Fluid Mechanics Lab	same
ETME 4163L	ETME 3251	Instrumentation & Controls Lab	same
ETME 4244	ETME 3244	Applied Heat Transfer	same

2. **Proposed Catalog Copy.**

ETGR 1100L. Engineering Technology Computer Applications Laboratory. (1) Introduces the use of computer applications required for engineering technologists. Topics include using the computer to solve technical problems, an introduction to engineering computer applications, the use of standard office software, and the use of scientific calculators.

ETME 1111. CAD Modeling I. (3) Co-requisite: ETGR 1201.This course introduces the concepts of technical drawing and its relationship to the mechanical design process using a feature-based parametric modeler such as SolidWorks. Topics include sketching, orthographic projections, pictorial views, dimensioning techniques, and introduction to Computer-Aided-Design (CAD).

ETME ~~1104~~ 1112. ~~Technical Drawing II~~ CAD Modeling II. (~~2~~ 3) Prerequisite: ETGR 11~~03~~11(C or better). This course is a continuation of ETGR 11~~03~~11, and introduces the student to advanced modeling techniques ~~of~~ employed in ~~Computer Aided Drawing~~ Computer-Aided-Drawing (CAD). Topics include the use of linked features in drawings, traditional and geometric tolerancing, custom templates, assemblies, and basic animation. ~~three-dimensional wireframe, solid models, tolerancing methods, and rendering and generation of two-dimensional technical drawings from three-dimensional models. Upon completion of the course, students should be able to create, modify, and render three-dimensional models using modern computer aided drawing tools such as AutoCAD.~~

ETME 2100. Sophomore Design Practicum. (2) Prerequisites (C or better) ENGL 1100, ETME 1111 and ETGR 1201. Co-requisites or prerequisites: ETME 1112, and ETME 2130, Co-requisite: ETME 2100L. A sophomore level design practicum focused on a simple, defined mechanical design challenge. Projects will be completed individually and introduce students to the design process, project management, machine shop fabrication techniques, memo style report writing and final project demonstrations. Additionally, the course will reinforce topics learned in previous courses such as CAD modeling, documentation generation (drawings) and analytical modeling.

ETME 2100L. Sophomore Design Practicum Laboratory. (1) Co-requisite: ETME 2100. A sophomore level design practicum focused on a simple, defined mechanical design challenge. Projects will be completed individually and introduce students to the design process, project management, machine shop fabrication techniques, memo style report writing and final project demonstrations. Additionally, the course will reinforce topics learned in previous courses such as CAD modeling, documentation generation (drawings) and analytical modeling.

ETME 2102. Mechanisms. (3) Prerequisites(C or better): ETME 1111, ETGR ~~1103~~ 2171, PHYS 1101. This course covers plane motion and devices used to generate plane motion. Topics include analysis of displacement, velocity, acceleration, gears, cams and other mechanical systems.

ETME ~~1101~~ 2130. ~~Manufacturing Processes~~ Applied Materials and Manufacturing I. (3) Prerequisites (C or better): ETGR 1201. Co-requisites or prerequisites: CHEM 1251. ~~This course surveys and introduces common manufacturing processes and design for manufacture considerations. Student will be introduced to methods and equipment used to transform materials, and to the interdependency between geometry (form), materials properties, and processes and their effects on functionality of the manufactured artifact. Coverage will include processing of polymers, metals, and ceramics. The purpose of this course is to provide the students the conceptual understanding of materials processes.~~ The courses in this series present a fusion of material science and the applied processes used to form engineering materials into useful components or assesmblies. This course is part 1 of a two segment series. The first course focuses on metallic materials with crystalline structure, and the specific processes used to form and finish these materials. Practical instruction in theory of machine tool operation, casting, rolling and joining is presented. Alloying, heat treatment, corrosion and operational environment appropriate for the subject materials in discussed.

ETME ~~2101~~ 2131. Applied Materials and Manufacturing II. (3) Prerequisites: ~~MATH 1103~~ ETME 2130 (C or better), CHEM 1251, STAT 1220. ~~This course introduces the student to materials and to the concept that materials are designed to provide the desired properties in the same way that the parts themselves are designed. The students will learn to understand that the processes we use to change materials into the geometries we want for also change the properties of the materials. The course intends to approach materials from a design and manufacturing perspective.~~ A continuation of Applied Materials and Manufacturing I. This course focuses on non-metallic materials, polymer based materials, ceramics, composite materials and materials with amorphous atomic structure. A fusion of material science and the applied processes used to form the subject engineering materials into useful components or assemblies is presented. Molding autoclaving, ploymer cross-linking and operational environment appropriate for the subject materials is discussed. Manufacturing quality systems are discussed. Two lecture hours per week.

ETME 3100. Junior Design Practicum. (2) Prerequisites: ENGL 1102, ETME 2100 and ETME 3133 (C or better). Co-requisites or prerequisites: ETME 3143, Co-requisite: ETME 3100L A junior level design studio focused on a more complex, but still completely defined, thermo-fluids and energy system based design challenge. Projects will be completed in teams (2-3) and introduce students to group project dynamics, advanced machine shop techniques, data acquisition and analysis. Additionally, the course will reinforce topics learned in previous courses such as the design process, project management, formal report style writing, math modeling (Excel, MATLAB, MathCad and EES), documentation generation (Drawings + Procedure), final project demonstrations and analytical modeling.

ETME 3100L. Junior Design Practicum Laboratory. (1) Co-requisite: ETME 3100. A junior level design practicum focused on a more complex, but defined, thermo-fluids and energy system based design challenge. Projects will be completed in teams (3-4) and introduce students to group project dynamics, advanced machine shop techniques, data acquisition and analysis. Additionally, the course will reinforce topics learned in previous courses such as the design process, project management, formal report style writing, math modeling (Excel, MATLAB, MathCad and/or EES), documentation generation (Drawings + Procedure), final project demonstrations and analytical modeling. This course meets for one (1) three (3) hour laboratory session each week.

ETME 3113. Dynamics. (3) Prerequisites: ~~MATH 1121~~, ETGR 2272, ETGR 2101 (C or better), PHYS 1101 (C or better), and ETME 2102. The dynamic behavior of particles; translation, rotation and plane motion of a rigid body, the principles of conservation of energy and momentum.

ETME 3123. Strength of Materials. (3) Prerequisites: ETGR 2101 with a ~~grade of~~ C or ~~above~~ better, ETGR 2272. Stress-strain relationships resulting from direct loads, torsional loads and bending loads, and the results obtained from applying more than one of these loads simultaneously. Beam deflection and column loading.

ETME ~~3152~~ 3123L. Stress Analysis Laboratory. (1) (W) Prerequisite or ~~corequisite~~ co-requisite: STAT 1220, ETME 3123. Prerequisites: ENGL 1102 (C or better), ETGR 1100L (C or better). Experiments illustrating stress-strain relationships in engineering materials and the use of brittle coating, photoelasticity and electrical-resistance strain gages.

ETME 3133. Fluid Mechanics. (3) Prerequisite: ETGR 2272, ETGR 1100L & ETGR 2101 with a C or better. Fundamental principles of fluid mechanics. Topics include manometry, buoyancy, forces on submerged bodies, boundary layers, flow over surfaces, Bernoulli's equation with applications, orifices, pipe losses and an introduction to hydrodynamics.

ETME ~~3151~~ 3133L. Fluid Mechanics Laboratory. (1) (W) Prerequisite or Corequisite: ETME 3133, Prerequisites: ENGL 1102(C or better), & ETGR 1100L (C or better). Flow through conduits and hydraulic components and in open channels~~, the~~ . The experimental determination of ~~fluid specific weights~~ viscosity ~~and flash and fire points.~~, viscous forces and resulting power losses. Flow measuring devices such as orifices, venturi tubes, anemometers and pitot tubes. ~~Laminar-turbulent~~ Laminar and turbulent flow ~~and stability~~. Performance of rotating machines such as Pelton turbines, centrifugal fans and hydrostatic transmissions.

ETME 3143. Thermodynamics. (3) Prerequisite~~: MATH 1121~~ or Co-requisite ETME 3100 Prerequisites: ETGR 2272, CHEM 1251, ETME 3133 (C or better). Fundamentals of thermodynamics including work and heat; classical approach to first and second laws of thermodynamics; ideal gas, entropy, reversibility, irreversibility, and study of various processes and cycles.

ETME 3150. Applied CAD Modeling and Simulation. (3) Prerequisites: ETME 1112 (C or better), ETME 2102 Corequisites: ETME 3123 and ETME 3113. This course is a continuation of ETME 1112, and introduces the student to the use of some of the tools available for the analysis of parametrically-constructed CAD models. Topics include the finite element method, finite element analysis (FEA), the use of FEA for stress analysis, thermal analysis, and motion studies, and the important distinctions between FEA results, theoretical results, and experimental results.

ETME 3213. Machine Design I. (3) Co-requisite or prerequisite: ETME 3100. Prerequisites: ETME ~~1101~~ 2130, ETME ~~2101~~ 3113, and ETME 3123. Analysis and design of clutches, brakes, belts and roller chain. Indeterminate normal loading, superposition of stresses and deflections, compound stresses, columns and fatigue. Theories of failure. Shaft design, deflections of shafts with non-uniform moments of inertia involving computer verification. Antifriction bearings, engineering materials, helical compression springs. Small mechanical component and system designs.

ETME ~~3252~~ 4143L. Thermodynamics and Heat Transfer Laboratory. (1) (W) Prerequisites: ENGL 1102 (C or better), STAT 1220. Prerequisite or co-requisite: ETME 3143, ETME 4244. Experimentation involving the fundamental principles of thermodynamics and heat transfer, as applied to internal combustion engines, steam engines, engine dynamometers, refrigeration and heat pumps, solar energy systems, and heat exchangers. Three laboratory hours per week.

ETME 4163. Instrumentation and Controls. (3) Prerequisites: ETGR 2106, ETGR 2122, ETGR 2272. Introduction to instrumentation for measurement and control of physical variables, with emphasis on electronic systems. Electrical instruments, signal conditionng circuits, sensors, measurement principles and data acquisition using high level language such as LabVIEW are investigated. Analog and computer-based controllers including PID are introduced. Discrete state controllers such as Programmable Logic Controllers (PLC) are taught from a systems point of view. Topics include Wheatstone bridge, H-Bridge, op-amps, thermal, mechanical, optical sensors, PLC and PID controllers.

ETME ~~3251~~ 4163L. Instrumentation Laboratory. (1) (W) ~~Cross-listed as ELET 2241L.~~ Prerequisite or co-requisite: ETME ~~3163~~ 4163. Prerequisites: ENGL 1102 (C or better), STAT 1220. Practice in the use of the various instrumentation devices studied in ETME ~~3163~~ 4163.

ETGR 4100. ~~Engineering Technology Interdisciplinary Industrial Senior~~ Capstone Design Project I. (2) (W, O) ~~Prerequisites for MET students: ETME 3143 and ETME 3213. Pre- or corequisite for MET students: ETME 3164 or permission. Prerequisites for ELET students: Senior standing in department. Corequisite for ELET students: ELET 4191. Prerequisites for CIET students: ETCE 4251.~~ Prerequisites: All freshman, sophomore and junior level technical courses. Pre- or co-requisite: ETME 4163, ETME 4244. ~~This is the first~~ First of a two-semester course sequence in ~~senior design that utilizes industrial and university sponsored projects to expose engineering technology students in their final year of training to real world project execution and management, in addition to demonstrating~~ which student teams will implement a senior-level design project which demonstrates abilities as developed by the coursework taken thus far. ~~These projects are usually interdisciplinary in nature, involving students in groups that contain more than one engineering discipline. Projects are defined for the students by statements of work issued by the funding entities. In the first semester, students are exposed to proper project management and planning methodology, along with project documentation. This course meets for one (1) lecture hours and three (3) laboratory hours per week. *(Fall)*~~ Project planning techniques will be utilized to make substantial progress toward implementation of a design solution. One class hour and three lab hours per week.

ETGR 4200. ~~Engineering Technology Interdisciplinary Industrial Senior~~ Capstone Design Project II. (2) (W, O) Prerequisite: ETGR 4100 ~~with a grade of C or above~~. ~~Prerequisite for ELET students: ELET 4191 with a grade of C or above. This is the second~~ Second of a two-semester course sequence in ~~senior design that utilizes industrial and university sponsored projects. Students will incorporate Applied Project Management techniques into the capstone project identified in ETGR 4100, in addition to executing the design plans generated in ETGR 4100. This course meets for one (1) lecture hours and three (3) laboratory hours per week. *(Spring)*~~ which student teams will continue to implement a senior-level design project which demonstrates abilities as developed by the coursework taken thus far. The design solution developed in the first semester will be completed and evaluated during the second semester. The primary engineering results delivered will be a set of rational decisions, where the rationality of those decisions will be supported by the appropriate analysis and testing. The quality of the design will usually be reflected in a prototype of either the hardware or software system. One class hour and three lab hours per week.

ETGR 3295. Multidisciplinary Professional Development (1) Prerequisite: Senior or Junior standing. A series of multidisciplinary and disciplinary seminars and activities designed to introduce students to basic concepts of professionalism in engineering. Topics include global, societal, and contemporary issues of current interest such as leadership, entrepreneurship, ethics, cultural diversity, and professional licensure.

ETME ~~3244~~ 4244. Applied Heat Transfer. (3) Prerequisites: ETME ~~3133~~ 3143, ETGR 2272. Basic principles of heat transfer. Theory and applications of conduction, free and forced convection and radiation heat transfer. Heat exchangers and heat transfer measurement. ~~*(Fall)*~~

B. JUSTIFICATION.

1. Need.

The Department of Engineering Technology and Construction Management at UNC Charlotte has provided a high quality technical education for over 30 years, with several of the department's programs satisfying rigorous accreditation standards through TAC/ABET. The proposed revision to the Mechanical Engineering Technology program curriculum allows us to simultaneously continue this tradition of quality education of the region's engineering technologists while making the program more current and technically relevant.

The proposed curriculum revision addresses deficiencies commonly cited by industry in engineering and technology programs nationally and addresses changes in specialized accreditation standards and best practices; namely, the lack of practical instruction and application in the areas of communication skills, project management, and holistic project development and realization. The revision exposes students to a cohesive and integrated treatment of important topics necessary for their success as practicing engineering technologists. It affords them the flexibility to specialize in an area of interest, such as energy or machine design, through the choice of major electives in the senior year. The new vertically integrated design sequence beginning in the freshman year allows students to participate in a meaningful capstone experience, including industry sponsored and/or interdisciplinary design projects. Finally, graduates of the revised curriculum will be better prepared to pursue professional accreditation and graduate studies.

2. Prerequisites/Co-requisites.

Courses identified in this proposal are freshman, sophomore, junior, and senior level. Pre-requisites and co-requisites have been established, where warranted, and are indicated in the course descriptions provided. Pre- and co-requisites are necessary for successful knowledge transfer and assimilation and to satisfy all applicable accreditation standards and requirements.

3. Course Numbering.

Course numbering in this proposal is consistent with the university policy for undergraduate courses and the level of academic achievement of students for whom it is intended.

4. Improvement of Scope, Quality and Efficiency of Program and Instruction.

The revised curriculum offers a comprehensive, integrated, and relevant yet flexible program that is broad-based. It reflects current technologies, knowledge, and skills desired by employers and required for specialized accreditation. It also better prepares graduates to pursue professional licensure and graduate studies

C. IMPACT

1. **Students Served.**
   Undergraduate students pursuing Mechanical Engineering Technology will be served by this proposal. Junior level transfer students with appropriate Associate of Applied Science (AAS) degrees will be able to matriculate into the on-campus four-year program under the department's existing 2+2 transfer arrangement.

2. **Effect on Existing Courses and Curricula.**

   a. Added Courses
   New courses and laboratories will be taught on-campus on an annual basis beginning in Fall 2012.

   b. Other Courses
   The content and frequency of courses that have been renumbered will not be affected. Currently offered courses that are not identified as part of the revised curriculum will be discontinued. No substantive topical content or material currently provided will be removed.

   c. Anticipated Enrollment in Added Courses
   Since this proposal details a revision of the current MET curriculum, enrollment in new courses will be consistent with enrollment in the current curriculum. It is anticipated that the MET enrollment will increase by about 5% per year.

   d. Effect on Other Course Enrollment
   Enrollments in courses outside of the Department of Engineering Technology and Construction Management are expected to increase commensurate with the increase in MET enrollment.

   e. Special Topics Courses
   None of the courses in this proposal have been previously offered under special topic numbering.

   f. Other Catalog Copy Changes
   Proposed changes and additions to catalog copy, which will reflect curriculum outlines, course requirements, and program requirements, are as follows:

- ***Current catalog copy from 2011-2012 online catalog:***
  Disciplines of study in Engineering Technology at UNC Charlotte include: […]

Mechanical Engineering Technology, Mechanical Engineering Technology includes technical and mechanical drawing, computer-aided design, machine design, manufacturing and machine processes, fluid power systems, statics and strength of materials, mechanisms, stress analysis, instrumentation and controls, thermodynamic systems, heat transfer, dynamics, methods analysis and engineering economics.

Revised catalog copy:
Disciplines of study in Engineering Technology at UNC Charlotte include: […]

Mechanical Engineering Technology, Mechanical Engineering Technology includes technical and mechanical drawing, computer-aided design, machine design, manufacturing and machine processes, fluid power systems, statics and strength of materials, mechanisms, stress analysis, instrumentation and controls, thermodynamic systems, energy, heat transfer, dynamics, methods analysis and engineering economics.

A concentration in applied energy is available in which students may focus their major elective courses by choosing to take four energy-related courses, including:

ENER 4245 Energy Management

ENER 4250 Analysis of Renewable Energy Systems

ENER 4260 Hydrogen Production and Storage

ENER 4275 Air Conditioning Systems

ENER 4270 Fuel Cell Technology

Other courses as approved

- ***Current catalog copy from 2011-2012 online catalog:***

  Discipline Specific Prerequisites:
  Mechanical

- Drafting/Computer Aided Drafting
- Machine Processes
- Statics
- Metallurgy or Engineering Materials
- Kinematics or Mechanisms
- Basic Electrical Circuits (in addition to Physics II)
- Computer Programming (using a higher level language such as Visual Basic, FORTRAN, or C++)

  Revised catalog copy:
  Discipline Specific Prerequisites:
  Mechanical

- 3D Parametric Modeling
- ~~Drafting/Computer Aided Drafting~~
- Manufacturing Processes
- ~~Machine Processes~~
- Machine Shop Practices
- Introduction to Design
- Statics
- Metallurgy or Engineering Materials
- Kinematics or Mechanisms
- Basic ~~Electrical~~DC Circuits (in addition to Physics II)

- Computer Programming (using a higher level language such as Visual Basic, FORTRAN, or C++)

- ***Revised catalog copy:***
  - **Suggested Curriculum:**

Mechanical Engineering Technology Program

First Year	
Fall Semester	
Course	**Credits**
ENGL 1101 English Composition	3
MATH 1103 Precalculus [1] ~~MATH 1100 College Algebra & Probability~~	3
PHYS 1101 Introductory Physics I	3
PHYS 1101L Introductory Physics I Lab	1
ETGR 1100L Engineering Technology Computer Application	1~~3~~
ETME~~GR~~ 111103 ~~Technical Drawing I~~CAD Modeling 1	3~~2~~
ETGR 1201 Introduction to Engineering Technology	2
	16~~7~~

Spring Semester	
Course	**Credits**
ENGL 1102 Writing in the Academic Community	3
~~MATH 1103 Precalculus Math for Science and Engineering~~ MATH 1121or ETGR 2171[1]	3
PHYS 1102 Introductory Physics II	3
PHYS 1102L Introductory Physics II Lab	1
ETME~~GR~~ 111204 CAD Modeling 2~~Technical Drawing II~~	3~~2~~
Social Science Elective[2] ~~ETME 1101 Manufacturing Processes~~	3
	16~~5~~

Second Year

Fall Semester

Course	Credits
STAT 1220 Elements of Statistics I ~~MATH 1121 Calculus for Engineering Technology~~	3
ETGR 2101 Applied Mechanics I	3
ETME 2100~~ETME 2156 Machine Shop Practices~~Sophomore Design Practicum	2
ETME 2100L~~56~~ Sophomore Design Practicum Lab~~Machine Shop Practices Lab~~	1
ETME 21300~~1~~ ~~Applied~~ Materials & Manufacturing 1	3
CHEM 1251 Principles of Chemistry ~~ETME 2202 Introduction to Mechanical Design~~	3~~2~~
~~Social Science General Education Elective~~	15~~3~~

Spring Semester

Course	Credits
ETME 2131 Materials & Manufacturing 2~~STAT 1220 Elements of Statistics I~~	2~~3~~
ETGR 2106 ~~AC & DC Circuits~~Electronic Circuits & Devices	3
ETME 2102 Mechanisms	3
ETGR 2122 Technical Programming	3
ETGR 2272 Engineering Analysis 2	3
LBST 2101~~1~~ Western Culture & History[2]~~*~~	3
	17

Third Year

Fall Semester

Course	Credits
ETGR 3071 ET Professional Seminar	1
ETGR 3171 Engineering Analysis 3~~I~~ or ETGR 4272 Engineering Analysis 4	3
ETME 3123 Strength of Materials	3
ETME 3133 Fluid Mechanics	3
ETME 3150 Modeling & Simulation	3
ETME 3123L~~52~~ Stress Analysis Lab	1
ETME 3113 Dynamics~~LBST 110X Arts & Society*~~	3
	17

Spring Semester

Course	Credits
ETME 3100 Junior Design Practicum ~~CHEM 1251 Principles of Chemistry~~	2~~3~~
3100L Junior Design Practicum Lab ~~ETGR 3222 Engineering Economics~~	1~~3~~
ETME 3213 Machine Design I~~ETME 3113 Dynamics~~	3
ETME 3143 Thermodynamics	3
ETME 3133L~~51~~ Fluid Mechanics Lab	1
ETGR 3222 Engineering Economics~~LBST 2102 Global & Intercultural Connections*~~	3
LBST 110X Arts & Society[2]	3
	16

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Fourth Year	
Fall Semester	
Course	**Credits**
ETGR 4100 Capstone Design 1~~ETGR 3272 Applied Numerical Methods~~	2~~3~~
ETME 4163 Instrumentation & Controls ~~ETME 3213 Machine Design I~~	3
ETME 4244 Applied Heat Transfer ~~ETME 3232 Senior Design Project I~~	3~~2~~
ETME 4143L~~3252~~ Thermodynamics & Heat Lab	1
LBST 2102 Global & Intercultural Connections[2]~~ETME 3244 Applied Heat Transfer~~	3
Major Elective[3]~~**~~	3
	15
Spring Semester	
Course	**Credits**
ETGR 4200 Capstone Design 2~~ETME 3242 Senior Design Project II~~	2
ETME 4163L~~3251~~ Instrumentation Lab	1
ETGR 3295 Multidisciplinary Professional Development~~ETME 3163 Instrumentation & Controls~~	~~3~~1
LBST 221X Ethical Issues & Cultural Critique [2]~~Major Elective**~~	3
Major Elective[3]~~**~~	3
Major Elective[3]~~LBST 221X Ethical Issues & Cultural Critique~~	3
Major Elective[3]	3
	16

Total Credit Hours = 12~~8~~4

MET Curriculum Outline Footnotes:

(1) Course selected based on Math Placement Test.

(2) General education courses are chosen jointly by student and advisor to ensure that all graduation requirements are met. Non-AAS degreed students must satisfy University and Department General Education requirements. AAS degreed students must satisfy Department General Education requirements.

(3) Major elective courses are approved by the Department as major electives for the respective program. A list is maintained in and published by the Department.

~~*Directed electives may be major field courses or General Education courses. They are chosen jointly by student and advisor to ensure that all graduation requirements are met.~~

~~**Major elective courses are approved by the Department as major electives for the respective program. A list is maintained in and published by the Department.~~

~~***Transfer students with an AAS may have completed differing science courses at the community college. Generally, AAS transfer students entering the Mechanical or Electrical ET programs will take Chemistry in the junior year at UNC Charlotte; however, the following chart will provide additional guidance for fulfilling the science requirement at UNC Charlotte:~~

~~**Mechanical & Electrical ET Transfer Students with an AAS Degree who have previously taken:**~~	~~**Shall Take at UNC Charlotte:**~~
~~2 semesters of physics and no chemistry~~	~~CHEM 1251~~
~~1 semester of physics and 1 semester of chemistry~~	~~PHYS 1102 with lab~~
~~2 semesters of physics and 1 semester of chemistry~~	~~GEOL 1200, BIOL 1110, PHYS 1130, or CHEM 1252~~

D. RESOURCES REQUIRED TO SUPPORT PROPOSAL

1. Personnel.

a. New Instructional Requirements and Impact on Present Faculty Load

Currently, nine full-time faculty members deliver the MET program. There will be no additional faculty requirements and present faculty load will be unchanged.

b. Qualified Faculty Interested in Teaching New Courses

Current full-time MET faculty consist of: Nan Byars, Rodney Handy, Dan Hoch, Ted Jarrell, Ronald Priebe, Peter Schmidt, Ahmad Sleiti, Patricia Tolley, and Wes Williams. Primary faculty and additional support for courses are provided in the table below.

Course	Primary Faculty	Other Qualified Faculty
ETME 1111	Jarrell	Williams, Schmidt
ETME 2100	Schmidt	Hoch, Jarrell, Priebe, Williams
ETME 2100L	Schmidt	Hoch, Jarrell, Priebe, Williams
ETME 3100	Hoch	Sleiti, Tolley, Byars, Handy
ETME 3100L	Hoch	Sleiti, Tolley, Byars, Handy
ETME 3150	Jarrell	Williams, Schmidt

2. **Physical Facility.**
No new facilities will be required to implement the proposed curriculum. Additional specialized laboratories will be brought online as part of regular program enhancement as funds become available.

3. **Equipment and Supplies.**
No additional equipment and supplies will be required to implement the proposed curriculum.

4. **Computer.**
No additional computers or software will be required to implement the proposed curriculum.

5. **Audio-Visual.**
No additional audio-visual capabilities will be required to implement the proposed curriculum.

6. **Other Resources.**
No additional resources will be required to implement the proposed curriculum.

7. **Funding Sources for New/Additional Resources.**
No funding is required for new or additional resources to implement the proposed curriculum.

E. CONSULTATION WITH THE LIBRARY AND OTHER DEPARTMENTS OR UNITS

1. **Library Consultation.**
The Atkins Library reference staff was contacted in reference to this proposal. They have indicated that existing library holdings are adequate to support the proposal. The Consultation on Library Holdings dated March 20, 2012 is included in Appendix G1 of this document.

2. **Consultation with Other Departments or Units.**
The proposed curriculum revision will entail no additional assistance or support from other departments or units beyond what is currently incorporated into the MET program.

F. INITIATION AND CONSIDERATION OF THE PROPOSAL

1. **Originating Unit.**
The Department of Engineering Technology faculty unanimously approved this curriculum proposal on April 4, 2012.

2. **<u>Other Considering Units.</u>**
   The Mechanical Engineering Technology Industrial Advisory Board reviewed and approved the proposed curriculum during the Spring 2011 meeting.

G. ATTACHMENTS

1. Consultation Documentation.
2. Proposed Course Outlines.

Appendix G1: Consultation Documentation

UNC CHARLOTTE

J. Murrey Atkins Library

Consultation on Library Holdings

To: **Peter Schmidt**

From: **Alison Bradley**

Date: **3/20/12**

Subject: **MET Curriculum: Proposed changes**

Summary of Librarian's Evaluation of Holdings:

Evaluator: Alison Bradley **Date: 3/20/12**

Check One:

1. Holdings are superior
2. Holdings are adequate

__x

3. Holdings are adequate only if Dept. purchases additional items.

4. Holdings are inadequate

Comments:
Library holdings should be adequate to support student research in the new proposed curriculum for Mechanical Engineering Technology. Many of the changes do not significantly alter the research content for students' work, and proposed expansions into areas like project management, communication, or applied energy are supported by library purchasing for the College of Business, EPIC, and other areas. (See attached list of holdings by LC Subject.) Databases like Compendex, Inspec, IEEE Xplore, ASTM Digital Library, and Business Source Premier (among others) are available to all UNCC students. Librarian support for students taking Sophomore and Junior Design or the Capstone project will ensure that students are able to fully realize the value of research collections available to them. Students who elect to study topics outside of the library's focus have access to materials via Interlibrary Loan and consortial borrowing as well.

Alison Bradley

Evaluator's Signature

3/20/12

Date

Current Library Holdings by Subject

LC Subject Heading	Total items	Periodicals	Electronic resources
Materials	2108	45	904
Manufacturing Processes	434	14	179
Project Management	582	0	108
Metallurgy	458	14	61
Computer Aided Design	427	4	121
Computer Programming	652	15	69

Appendix G2: Proposed Course Outlines

ETME 1111 CAD Modeling 1

Catalog Data This course introduces the concepts of technical drawing and its relationship to the mechanical design process using a feature-based parametric modeler such as SolidWorks. Topics include sketching, orthographic projections, pictorial views, dimensioning techniques, and introduction to Computer-Aided-Design (CAD).

References *Modern Graphics Communication, 4e*, Giesecke et al., Prentice-Hall, 2010, ISBN: 978-0-13515-103-7.

Parametric Modeling with SolidWorks 2011, Shih and Schilling, SDC Publications, 2011. ISBN: 978-1-58503-633-2.

Goals This is the first of a three-course sequence that introduces the concepts and techniques in the use of parametric CAD modeling. Emphasis is placed on the development of core competencies of visualization, construction of solid models, and development of engineering drawings from these solid models.

Corequisite ETGR 1201 Introduction to Engineering Technology

Class Topics The following topics are presented in this course:

- Basic sketching techniques
- Orthographic projection
- Pictorial projections
- Use of sketch planes
- Dimensional and geometric parameters
- Feature history tree
- Construction and use of part templates
- Parent and child feature relations
- Reference geometry
- Drawing documents
- Patterned features
- Customizing and use of drawing templates

Outcomes Upon successful completion of this course, students will be able to:

1. Use appropriate methods to prepare orthographic and pictorial sketches.
2. Construct fully-defined solid geometry features.
3. Generate mechanical drawings from part document files.
4. Construct customized file templates for part and drawing documents.

Course Outcomes 1 through 4 above support achievement of Program Outcome 1.

Proficiency is demonstrated by means of an end-of-term examination.

Computer Usage Course is based on developing proficiency with a feature-based parametric modeling CAD system

Laboratory None

Design Content None

Grading To be determined by instructor

Follow-up Courses ETME 1112 CAD Modeling 2
ETME 3100 CAD Modeling and Simulation

Revised 08/01/11
OAA/lz

ETME 1112 CAD Modeling 2

Catalog Data This course is a continuation of ETME 1111 and introduces the student to advanced modeling techniques employed in Computer-Aided-Design (CAD). Topics include the use of linked features in drawings, traditional and geometric tolerancing, custom templates, assemblies, and basic animation

References *Modern Graphics Communication, 4e*, Giesecke et al., Prentice-Hall, 2010, ISBN: 978-0-13515-103-7.

Parametric Modeling with SolidWorks 2011, Shih and Schilling, SDC Publications, 2011. ISBN: 978-1-58503-633-2.

Goals This is the second of a three-course sequence that introduces the concepts and techniques in the use of parametric CAD modeling. Emphasis is placed on the development of core competencies of the use of variable parameters, dimensional and toleranced callouts, assemblies and animation, and the construction of more complex mechanical components based on their drawing and design specifications.

Prerequisites ETME 1111 CAD Modeling 1 (C or better)
ETGR 1201 Introduction to Engineering Technology (C or better)

Class Topics The following topics are presented in this course:

- Specification of user-defined part and drawing templates
- Use of linked data in drawings
- Use of conventional plus/minus tolerancing
- Use of geometric dimensioning and tolerancing (GD & T)
- Parametric variables used in geometry construction
- Assemblies
- Basic animation and rendering
- Motion analysis
- Multi-body solids
- Complex sweeps and lofts
- Sheet metal
- Weldments

Outcomes Upon successful completion of this course, students will be able to:

1. Prepare and modify customized part and template files.
2. Import linked information into drawings.
3. Properly dimension and tolerance mechanical drawings using conventional and GD & T methods.
4. Employ links and equation variables to define feature geometry.
5. Construct assemblies from multiple components.
6. Construct advanced solids such as bridged multi-body solids, 3-d sweeps, and sheet metal components.

Course Outcomes 1 through 6 above support achievement of Program Outcome 1.

Proficiency is demonstrated by an end-of-term examination.

Computer Usage Course is based on developing extended proficiency with a feature-based parametric modeling CAD system

Laboratory None

Revised 08/01/11
OAA/lz

Design Content None

ETME 2100 – Sophomore Design Practicum

Catalog Data A sophomore level design practicum focused on a simple, defined mechanical design challenge. Projects will be completed individually and introduce students to the design process, project management, machine shop fabrication techniques, memo style report writing and final project demonstrations. Additionally, the course will reinforce topics learned in previous courses such as CAD modeling, documentation generation (drawings) and analytical modeling. This course meets for two (2) lecture hours per week. Two (2) credit hours.

References
Machine Designer's Reference, J. Marrs, ISBN 978-0-8311-3432-7
Interpretation of Geometric Dimensioning and Tolerancing, Daniel E. Puncochar and Ken Evans, 3rd Edition,, ISBN 978-0-8311-3421-1
Blue Print Reading Basics, Warren Hammer, 3rd Edition, ISBN 978-0-8311-3125-8

Goals This is a part of the first module of a three-part sequence that introduces the fundamental concepts and techniques used in the design of mechanical systems to solve a given problem. This course introduces the design process and its integration with the project management process.

Prerequisite
ETGR 1201: Introduction to Engineering Technology (C or better)
ETME 1112: CAD Modeling 2 for MET
(or Co-requisite) ETME 2100: Applied Materials and Manufacturing 1
(or Co-requisite) CHEM 1251: Chemistry
Co-requisite ETME 2100L: Sophomore Design Practicum Laboratory

Class Topics After an introduction to design concepts, the following topics will be investigated:

- The Design Process
- Gathering Design Requirements and Specifications
- Project Scheduling
- Practical Machining Instruction
- Print Reading
- Manufacturing Tolerances
- Geometric Dimensioning and Tolerancing
- Report Writing
- Presentations

Outcomes Upon successful completion of this course, students will be able to:

5. Demonstrate an understanding of the design process.
6. Demonstrate an understanding of fundamental machining processes.
7. Display proficiency in the use of project management software.
8. Display proficiency in report writing.

Computer Usage Project Management Software, CAD Modeling Software, Word Processing Software

Laboratory Co-requisite, ETME 2100L: Sophomore Design Practicum Laboratory

Design Content Students will be required to analyze a design problem, create a solution, fabricate the solution and then demonstrate the success of their design.

Grading To be determined by instructor

Follow-up Courses
ETME 3150: Applied CAD Modeling and Simulation
ETME 3100: Junior Design Practicum
ETME 3100L: Junior Design Practicum Laboratory
ETGR 4100/4200: Senior Design

Note: Texts for this course will also be used in ETME 3100 and ETME 3100L

ETME 2100L – Sophomore Design Practicum Laboratory

Catalog Data A sophomore level design practicum focused on a simple, defined mechanical design challenge. Projects will be completed individually and introduce students to the design process, project management, machine shop fabrication techniques, memo style report writing and final project demonstrations. Additionally, the course will reinforce topics learned in previous courses such as CAD modeling, documentation generation (drawings) and analytical modeling. This course meets for one (1) three hour lab session each week. One (1) credit hour.

References
Machine Designer's Reference, J. Marrs, ISBN 978-0-8311-3432-7
Interpretation of Geometric Dimensioning and Tolerancing, Daniel E. Puncochar and Ken Evans, 3rd Edition,, ISBN 978-0-8311-3421-1
Blue Print Reading Basics, Warren Hammer, 3rd Edition, ISBN 978-0-8311-3125-8

Goals This is a part of the first module of a three-part sequence that introduces the fundamental concepts and techniques used in the design of mechanical systems to solve a given problem. This course introduces the students to machining processes in a laboratory setting.

Prerequisite
ETGR 1201: Introduction to Engineering Technology (C or better)
ETME 1112: CAD Modeling 2 for MET
(or Co-requisite) ETME 2100: Applied Materials and Manufacturing 1
(or Co-requisite) CHEM 1251: Chemistry
Co-requisite ETME 2100: Sophomore Design Practicum

Class Topics After an introduction to design concepts, the following topics will be investigated:

- The Design Process
- Gathering Design Requirements and Specifications
- Project Scheduling
- Practical Machining Instruction
- Print Reading
- Manufacturing Tolerances
- Geometric Dimensioning and Tolerancing
- Report Writing
- Presentations

Outcomes Upon successful completion of this course, students will be able to:

9. Demonstrate an understanding of the design process.
10. Demonstrate an understanding of fundamental machining processes.
11. Demonstrate proficiency in machining and fabrication of mechanical assemblies.

Computer Usage Project Management Software, CAD Modeling Software, CNC Machining Software, RP Software

Laboratory 1 session per week, supervised by the machine shop manager

Design Content Students will be required to analyze a design problem, create a solution, fabricate the solution and then demonstrate the success of their design.

Grading To be determined by instructor

Follow-up Courses
ETME 3150: Applied CAD Modeling and Simulation
ETME 3100: Junior Design Practicum
ETME 3100L: Junior Design Practicum Laboratory
ETGR 4100/4200: Senior Design

Note: Texts for this course will also be used in ETME 3100 and ETME 3100L

ETGR 2106 Circuits and Devices

Catalog Data This course provides and introduction to AC and DC circuits. Simple series and series-parallel circuits will be used to illustrate applications of Ohm's Law and Kirchhoff's Laws. Power in DC resistive circuits will be discussed. Sine waves, complex numbers, and phasors will be introduced to show the application to AC circuit analysis. Capacitors and inductors and their effects will be covered.

References Boylestad's *Introductory Circuit Analysis,* 2010 (ISBN 0137146663)

Goals This is the first course for Mechanical Engineering Technology students that covers the fundamental concepts and laws that govern electricity in circuits. Emphasis will be placed on developing a strong foundation in DC circuits, with analogous AC applications being introduced later in the course.

Prerequisite PHYS 1102 (C or better), MATH 1100 (C or better)

Class Topics After a review of the basic physical model of electricity, the following topics will be investigated:

- Ohm's Law
- Kirchoff's Voltage and Current Laws
- Effective Resistances in Series and Parallel
- Tools for Measuring Electrical Properties: Multimeter
- Capacitors
- High Pass and Low Pass Filters
- Diodes and Transistors
- Characteristics of AC Circuits
- Tools for Measuring Electrical Properties: Oscilloscope
- Inductors
- AC Circuit Analysis: Ohm's Law, Series-Parallel Combinations, Nodal and Mesh Analysis

Outcomes Upon successful completion of this course, students will be able to:

1. Demonstrate an understanding of fundamental laws for analyzing DC circuits
2. Proficiently apply KVL and KCL to determine nodal voltages, effective resistances for series and parallel components.

3. Read a series-parallel schematic of a DC circuit and be able to determine the types of components and calculate relevant properties (nodal voltages, currents, etc.)
4. Demonstrate an understanding of basic parameters of AC, frequency, period, amplitude peak-peak, and amplitude RMS.

Computer Usage Engineering Equation Solver, Multisim,

Laboratory None, though in class demonstrations will be included reinforce concepts covered in the lecture.

Grading To be determined by instructor

Follow-up Courses ETME 3163: Instrumentation and Controls

ETME 2130 Applied Materials and Manufacturing I

Catalog Data The courses in this series present a fusion of material science and the applied processes used to form engineering materials into useful components or assemblies. This course is part 1 of a two segment series. This first course focuses on metallic materials with crystalline structure, and the specific processes used to form and finish these materials. Practical instruction in theory of machine tool operation, casting, rolling and joining is presented. Alloying, heat treatment, corrosion and operational environment appropriate for the subject materials is discussed. Three lecture hours per week. Three (3) credit hours. (Fall)

References *Degarmo's Materials and Processes in Manufacturing*, 11th Edition, J. T. Black and Ronald A. Kohser , ISBN-13 978-0-470-92467-9

Goals This is the first of a two-part sequence that introduces the fundamental concepts and processes used to manipulate engineering materials for manufacturing purposes. Emphasis will be placed on metallic materials and the processes used to shape them into manufactured goods.

Prerequisite ETGR 1201: Introduction to Engineering Technology (C or better)
(or Co-requisite) CHEM 1251: Chemistry

Class Topics After an introduction to basic manufacturing concepts, the following topics will be investigated:

- Metallic Microstructure, Crystalline materials
- Nature of Metals and Alloys
- Ferrous Metal Phase Diagrams
- Heat Treatment
- Ferrous Metals and Alloys
- Nonferrous Metals and Alloys
- Metallic Material Selection
- Metal Casting
- Metal Forming
- Powdered Metal Process
- Additive Manufacturing with Metallic Materials
- Machining Processes
- Joining and Welding

- Brazing and Soldering
- Measurement and Inspection

Outcomes Upon successful completion of this course, students will be able to:

12. Demonstrate an understanding of fundamental manufacturing processes used with metallic materials.
13. Display proficiency in the terminology of these processes.
14. Demonstrate an understanding of how the processes investigated in this course affect design decisions

Computer Usage None

Laboratory None

Design Content Students will be required to visit the Capstone Course Design Exposition and apply knowledge gained in the course to propose a manufacturing method for some component viewed as a part of the Exposition.

Grading To be determined by instructor

Follow-up Courses ETME 2200: Applied Materials and Manufacturing II
ETME 3123: Strength of Materials
ETME 2100 Sophomore Design Practicum

ETME 2131 Applied Materials and Manufacturing II

Catalog Data The courses in this series present a fusion of material science and the applied processes used to form engineering materials into useful components or assemblies. This course is part 2 of a two segment series. This course focuses on non-metallic materials with polymer structure, and the specific processes used to form and finish these materials. Practical instruction in theory of molding, layup and continuous processing presented. Crosslinking, compounding, specification using ASTM – D -2000 and ASTM-D-4000 and operational environment appropriate for the subject materials is discussed. Manufacturing quality Systems are discussed. Two lecture hours per week. Two (2) credit hours. (Spring)

References *Degarmo's Materials and Processes in Manufacturing*, 11th Edition, J. T. Black and Ronald A. Kohser , ISBN-13 978-0-470-92467-9

Goals This is the second of a two-part sequence that introduces the fundamental concepts and processes used to manipulate engineering materials for manufacturing purposes. Emphasis will be placed on non-metallic materials and the processes used to shape them into manufactured goods.

Prerequisite ETME 2100: Applied Materials and Manufacturing I
CHEM 1251: Chemistry
(Pre or Corequisite) STAT 1220: Statistics

Class Topics After an introduction to basic manufacturing concepts, the following topics will be investigated:

- Non-metallic Microstructure, Polymeric materials
- Thermoplastic and Thermosetting behavior

- Ceramics and Glasses
- Non-metallic Material Selection
- Molding
- Bulk Forming Processes
- Additive Manufacturing with Non-metallic Materials
- Chemical and Electrochemical Manufacturing Processes
- Adhesives and Bonding
- Surface Engineering
- Micro/Nano Manufacturing
- Lean Engineering
- Quality Engineering Systems

Outcomes

Upon successful completion of this course, students will be able to:

15. Demonstrate an understanding of fundamental manufacturing processes used with non-metallic materials.
16. Display proficiency in the terminology of these processes.
17. Demonstrate an understanding of how the processes investigated in this course affect design decisions

Computer Usage Excel for statistical analysis and process control methods.

Laboratory None

Design Content Students will be required to visit the Capstone Course Design Exposition and apply knowledge gained in the course to propose a manufacturing method for some component viewed as a part of the Exposition.

Grading To be determined by instructor

Follow-up Courses
ETME 3123: Strength of Materials
ETME 3213: Machine Design I
ETME 3200: Junior Design Practicum

ETME 3100 – Junior Design Practicum

Catalog Data A junior level design practicum focused on a more complex, but defined, thermo-fluids and energy system based design challenge. Projects will be completed in teams (3-4) and introduce students to group project dynamics, advanced machine shop techniques, data acquisition and analysis. Additionally, the course will reinforce topics learned in previous courses such as the design process, project management, formal report style writing, math modeling (Excel, MATLAB, MathCad and EES), documentation generation (Drawings + Procedure), final project demonstrations and analytical modeling. This course meets for two (2) lecture hours per week with one three (3) hour laboratory session. Three (3) credit hours.

References
Machine Designer's Reference, J. Marrs, ISBN 978-0-8311-3432-7
Interpretation of Geometric Dimensioning and Tolerancing, Daniel E. Puncochar and Ken Evans, 3rd Edition,, ISBN 978-0-8311-3421-1
Blue Print Reading Basics, Warren Hammer, 3rd Edition, ISBN 978-0-8311-3125-8

Goals This is the second of a three-part sequence that reinforces the fundamental concepts and techniques used in the design of mechanical systems to solve a given problem. This course also continues to expose the students to machining processes in a laboratory setting.

Prerequisite ETME2100: Sophomore Design Practicum
ETME2100L: Sophomore Design Practicum Laboratory
ETME3133: Fluid Mechanics (C or better)
(or Co-requisite) ETME 3143: Thermodynamics (C or better)
Co-requisite ETME 3100L: Junior Design Practicum Laboratory

Class Topics After a review of design concepts, the following topics will be investigated:

- The Design Process
- Gathering Design Requirements and Specifications
- Project Scheduling
- Practical Machining Instruction
- Print Reading
- Manufacturing Tolerances
- Geometric Dimensioning and Tolerancing
- Report Writing
- Presentations

Outcomes Upon successful completion of this course, students will be able to:

18. Demonstrate an understanding of the design process.
19. Demonstrate an understanding of advanced machining processes.
20. Demonstrate an understanding of team dynamics.
21. Display proficiency in the use of project management software.
22. Display proficiency in report writing.
23. Display proficiency in analytical modeling.

Computer Usage Project Management software, CAD Modeling Software, Word Processing Software, Analytical Modeling Software

Laboratory 1 session per week, supervised by the machine shop manager

Design Content Students will be required to analyze a design problem, create a solution, fabricate the solution and then demonstrate the success of their design.

Grading To be determined by instructor

Follow-up Courses ETGR 4100/4200: Senior Design

Note: Texts for this course will also be used in ETME 2100 and 2100L

ETME 3100L – Junior Design Practicum Laboratory

Catalog Data A junior level design practicum focused on a more complex, but defined, thermo-fluids and energy system based design challenge. Projects will be completed in teams (3-4) and introduce students to group project dynamics, advanced machine shop techniques, data acquisition and analysis. Additionally, the course will reinforce topics learned in previous courses such as the design process, project management, formal report style writing, math modeling (Excel, MATLAB, MathCad and EES), documentation generation (Drawings +

Procedure), final project demonstrations and analytical modeling. This course meets for one (1) three (3) hour laboratory session each week. One (1) credit hour.

References

Machine Designer's Reference, J. Marrs, ISBN 978-0-8311-3432-7
Interpretation of Geometric Dimensioning and Tolerancing, Daniel E. Puncochar and Ken Evans, 3rd Edition,, ISBN 978-0-8311-3421-1
Blue Print Reading Basics, Warren Hammer, 3rd Edition, ISBN 978-0-8311-3125-8

Goals

This is a part of the second module of a three-part sequence that introduces the fundamental concepts and techniques used in the design of mechanical systems to solve a given problem. This course also continues to expose the students to machining processes in a laboratory setting.

Prerequisite

ETME2100: Sophomore Design Practicum
ETME2100L: Sophomore Design Practicum Laboratory
ETME3133: Fluid Mechanics (C or better)
(or Co-requisite) ETME 3143: Thermodynamics (C or better)
Co-requisite ETME 3100: Junior Design Practicum

Class Topics

After an introduction to design concepts, the following topics will be investigated:

- The Design Process
- Gathering Design Requirements and Specifications
- Project Scheduling
- Practical Machining Instruction
- Print Reading
- Manufacturing Tolerances
- Geometric Dimensioning and Tolerancing
- Report Writing
- Presentations

Outcomes

Upon successful completion of this course, students will be able to:

24. Demonstrate an understanding of the design process.
25. Demonstrate an understanding of advanced machining processes.
26. Demonstrate proficiency in machining and fabrication of mechanical assemblies.

Computer Usage

Project Management Software, CAD Modeling Software, CNC Machining Software, RP Software

Laboratory

1 session per week, supervised by the machine shop manager

Design Content

Students will be required to analyze a design problem, create a solution, fabricate the solution and then demonstrate the success of their design.

Grading

To be determined by instructor

Follow-up Courses

ETGR 4100/4200: Senior Design

Note: Texts for this course will also be used in ETME 2100 and 2100L

ETME 3150 Applied CAD Modeling and Simulation

Catalog Data This course is a continuation of ETME 1112, and introduces the student to the use of some of the tools available for the analysis of parametrically-constructed CAD models. Topics include the finite element method, finite element analysis (FEA), the use of FEA for stress analysis, thermal analysis, and motion studies, and the important distinctions between FEA results, theoretical results, and experimental results.

References *Introduction to Finite Element Analysis Using SolidWorks Simulation 2011*, Shih, SDC, 2011. ISBN: 978-1-58503-630-1.

Notes and assignments developed and written by course professors.

Goals This is the last of a three-course sequence that introduces the concepts and techniques in the use of parametric CAD modeling. Emphasis is placed on the development of core competencies of becoming familiar with the Finite Element Method and its strengths and limitations, interpretation of results, and its use in strength of materials, thermodynamics, and motion analysis problems.

Prerequisites ETME 1112 CAD Modeling 2 (C or better)
ETME 2102 Mechanisms

Pre/Corequisite ETME 3123 Strength of Materials

Class Topics The following topics are presented in this course:

- The Finite Element Method--the one-dimensional case
- Interpretation and validation of results
- Types of elements
- Modeling technique
- Symmetry and problem simplification
- Strength of materials/machine design problems
- Thermal studies
- Motion studies
- Assemblies

Outcomes Upon successful completion of this course, students will be able to:

27. Recognize and understand the use of the different element types.
28. Understand the limitations of finite element analysis.
29. Prepare and analyze a model using the appropriate boundary conditions and meshing criteria based on a given problem scenario.
30. Compare the results of an FEA study with the results of the classical equations for interpretation.
31. Simplify models where appropriate so that FEA solution time is improved.

Course Outcomes 1 through 5 above support achievement of Program Outcome 1.

Computer Usage Course is based on developing extended proficiency with a feature-based parametric modeling CAD system; use of spreadsheet and word processing software is occasionally used for organizing data and presenting assignments.

Laboratory None

Design Content Students are required to develop skills necessary for recognizing when feature geometry can or cannot be safely excluded from analysis. This requires some elements of mechanical design.

Revised 08/01/11
OAA/lz

Grading To be determined by instructor

Follow-up Courses None

ETGR 1100L Engineering Technology Computer Applications Laboratory

Catalog Data Introduces the use of computer applications required for engineering technologists. Topics include using the computer to solve technical problems, an introduction to engineering computer applications, the use of standard office software, and the use of scientific calculators.

References Thompson's Excel/Word bundle Microsoft Office Word 2010, Microsoft Office Excel 2010

Goals To introduce students to computer applications used by engineering technologists for solving technical problems, including standard office applications such as Word, PowerPoint, Project, Visio, and Excel. Also covered are the use of scientific calculators and various engineering applications software, such as Google Sketch and MultiSim.

Corequisite ETGR 1201 Introduction to Engineering Technology

Class Topics The following topics are presented in this course:

- Report preparation usingWord
- Problem solving using Excel
- Professional presentations using PowerPoint
- Project planning using Project
- Flowcharts using Visio
- Problem solving using calculators
- Simple circuits using MultiSim

Outcomes Upon successful completion of this course, students will be able to:

1. Using a calculator, plot a two dimensional function and solve three simultaneous equations.
2. Create Word documents including tables, inserted images, equation editor, appropriate use of fonts, spacing, and tabs.
3. In Excel, use basic functions such as sum and average, perform calculations using multiple columns of data, and use IF statements.
4. Use PowerPoint to produce profession quality presentations.
5. Use Visio to create flow charts and simple graphics to enhance professional reports.
6. Use MultiSim software package to create and simulate simple electrical circuits

Proficiency is demonstrated by means of an end-of-term examination.

Computer Usage This is a computer lab. Students will use Microsoft Word, Excel, Project, PowerPoint, and Visio; MultiSim and other software as appropriate

Laboratory Course will meet in one of a number of available computer laboratories.

Design Content None

Grading To be determined by instructor

ETGR 3295 Multidisciplinary Professional Development

Catalog Data Prerequisite: Senior or Junior standing. A series of multidisciplinary and disciplinary seminars and activities designed to introduce students to basic concepts of professionalism in engineering. Topics include global, societal, and contemporary issues of current interest such as leadership, entrepreneurship, ethics, cultural diversity, and professional licensure.

References *Selected readings as appropriate*

Goals This course prepares students to enter the workforce by addressing the some important non-technical aspects of a professional career

Prerequisite Junior or Senior standing

Class Topics The following topics will be investigated:

- Professional Code of Conduct
- Ethics
- Leadership
- Career planning and preparation
- Resumes, Interviewing and Job Search
- Additional related topics, based on the expertise of speakers selected that semester

Outcomes Upon successful completion of this course, students will be able to:

1. Prepare a professional quality resume
2. Articulate clear professional goals
3. Demonstrate improved interviewing skills
4. Discuss issues of professionalism and ethics using the Profession Code of Conduct

Computer Usage Microsoft Office software

Laboratory none

Design Content none

Grading To be determined by instructor