APPENDIX A – COURSE SYLLABI

ABET Course Syllabus

1. MET 1000 - Introduction to Mechanical Engineering Technology and Design, Fall 2020

2. 3 Credit Hours – Schedule: Tue., Thu. From 12:00-1:15 pm virtual

3. Instructor – Mary Foss

4. Text – N/A

5. Specific Course Information

   a. Introductory course for students interested or majoring in any of the engineering technology degrees. This provides students with a clear understanding of all of the degrees offered in engineering technology and possible career paths associated with each one. The students will be exposed to each discipline through several hands-on, laboratory experiences and introduce them to concepts needed for future classes. This course is a virtual class with optional in-person laboratory activities.

   b. Prerequisites: None

   c. Required Course

6. Course Goals

a. Student Outcomes: At the end of the course, students will be able to

i. Develop student competency in the use of equipment and tools common to the discipline.
ii. The students will be taught the fundamentals of how to use laboratory equipment including CAD systems, 3-D printers, Data Acquisition devices, traditional machining processes, and water jet cutting.
iii. Competence is determined through exam, reports, and hands-on laboratory evaluation.

b. ABET Outcomes

Students fulfill student outcome (1), an ability to apply knowledge, techniques, skills and modern tools or mathematics, science, engineering and technology to solve well-defined engineering problems appropriate to the discipline. Students fulfill this outcome through collecting data, analyzing data using statistical process software, and completing design and build projects utilizing the engineering design cycle to solve engineering problems.

Students fulfill student outcome (3), an ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments. Students fulfill this outcome through weekly assignments where they are graded not only on finding the correct answer, but also on the quality of their writing.

Students fulfill student outcome (5), an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives by working in a team environment to solve engineering design problems.

7. Topics Covered:

a. Introduction to Engineering Technology
b. Engineering Design Cycle
c. The Mechanical Engineering Profession
d. Brain Storming
e. Skills in MS Excel including data collection, analysis, and modeling
f. Design Documentation and Intellectual Property
g. Design Specifications and Design Technologies
h. Intellectual Property and Product Liability
i. Analyzing Designs and Prototyping
j. Testing and Evaluating
k. 3-d printing
l. Design, tolerances, and manufacturing planning
m. Basic statistics – mean, standard deviation
n. Manufacturing Processes including, metal forming, plasma cutting, machining, welding, waterjet cutting.

1. Course number and name: MET 2500 Modern Engineering Technology

2. Credit hours: 3 engineering
   Contact hours: 3 engineering

3. Instructor: Dustin Birch

4. Textbook: None

5. Specific course information:

   a. Catalog description:

      A survey of modern engineering technologies including, but not necessarily limited to, energy generation, nano systems, smart materials, robotics, lasers, transportation systems, and bioengineering.

   b. Prerequisites or co-requisites:

      MET 1500 – Mechanical Design Engineering

   c. Required (R), Elective (E), or Selected Elective (SE): R

6. Specific goals for the course:

   a. Learning outcomes:

      - Understand power generating technologies
      - Understand transportation systems
      - Understand advanced engineering materials
      - Understand lasers
      - Understand navigation and communications technologies
      - Understand engineering and design and analysis tools
      - Understand advanced computing tools

   b. Applicable student outcomes (ETAC - Criterion 3): 1

7. List of topics covered:

a. Introduction to energy, work, power
b. Introduction to basic thermodynamic and fluid mechanics concepts
c. Power generating technologies (Solar, Nuclear, Hydroelectric, Fossil Fuels, Wind)
d. Transportation systems (Automobiles, Railroads, Aircraft, Spacecraft)
e. Introduction to materials and material science
f. Advanced engineering materials (metals, inter-metallics, composites, ceramics, nano-materials)
g. Laser technologies
h. Navigation technologies (Radio Navigation, GPS, Range Finding / Triangulation)
i. Advanced computing technologies (CAE/CAD/CAM, FEA, CFD, Spreadsheets)

1. Course number and name: MET 3050 Dynamics

2. Credit hours: 3 engineering
   Contact hours: 3 engineering

3. Instructor: Dustin Birch

4. Textbook:

   Title: Engineering Mechanics, Dynamics, 14^{th} Ed.
   Author: Hibbeler
   Publisher: Pearson
   Year: 2015

5. Specific course information:

   a. Catalog description:

      Fundamentals of force, mass and acceleration, work and energy, and impulse and momentum applied to particles and rigid bodies.

   b. Prerequisites or co-requisites:

      MATH 1210 – Calculus I, PHYS 2210 – Physics for Scientists and Engineers I, and MFET 2300 – Statics and Strength of Materials

   c. Required (R), Elective (E), or Selected Elective (SE): R

6. Specific goals for the course:

   a. Learning outcomes:

      – Understand the theory and application of Engineering Mechanics - Dynamics.
      – Understand kinematics and kinetics, and their application to dynamic analysis of particles, systems of particle, and rigid bodies.
      – Understand the concepts of work and energy.
      – Understand conservative laws. Specifically, conservation of momentum and energy, and their application in analyzing dynamic systems.

– Understand the use of free-body diagrams, and their application in engineering mechanics.

b. Applicable student outcomes (ETAC - Criterion 3): 1

7. List of topics covered:

a. Rectilinear motion
b. Erratic motion
c. Curvilinear motion (Rectangular Coordinates)
d. Curvilinear motion (Normal/Tangential Coordinates)
e. Curvilinear motion (Cylindrical Coordinates)
f. Dependent motion
g. Relative motion
h. Equations of motion (Rectangular Coordinates)
i. Equations of motion (Normal/Tangential Coordinates)
j. Equations of motion (Cylindrical Coordinates)
k. Work and energy methods
l. Power and efficiency
m. Conservative principles
n. Linear momentum
o. Particle Impact
p. Angular impulse and momentum
q. Steady flow of a fluid stream
r. Planar kinematics of a rigid body
s. Absolute motion analysis of a rigid body
t. Relative motion analysis (Rigid Body Velocity)
u. Instantaneous center of zero velocity
v. Relative motion analysis (Rigid Body Acceleration)

Weber State University

1. Course number, name: MET 3150 Engineering Technology Materials

2. Credit hours: 3 credits hours
   Contact hours:

3. Instructor Dr. Daniel J. Magda

4. Textbook:

   Title: Engineering Materials Properties and Selection, 9th ed.
   Author: Edition, K.G. Budinski,
   Publisher: Prentice-Hall, New Jersey
   Year: 1999

5. Specific course information

   a. Brief description of the content of the course

   Material properties, processing and selection of materials for technological applications. Design parameters for material selection of metals and nonmetals. Mechanical behavior and service failures of metallic alloys and other engineering materials at high and low temperatures. Lecture plus laboratory work in materials testing.

   b. Prerequisites or co-requisites

   MFET 2300 Chem PS/SI1110

   c. Required (R)

6. Specific goals for the course:

   a. Specific outcomes of instruction

   · Students should be able to understand the terminology for classifying materials.
   · Student should be familiar with an array of material types that is sufficiently broad to satisfy most design requirements.
   · Choose appropriate materials for a specific design application
   · Understand how material properties are determined
   · Understand how material properties and altered by thermal processes
   · Understand how material properties are altered by manufacturing processes.
   · Students will be able to select materials based on their mechanical, physical, and chemical properties
   · Student will be able to conduct an ASTM tensile test and report data

b. explicity indicate which of the student outcomes listed within criterion 3 or any other outcomes are addressed by the course

outcome #4

7. Brief list of topics to be covered

· The importance of engineering materials
· Forming engineering materials from elements
· The role of chemical and physical properties in engineering materials
· The role of mechanical properties in engineering materials
· The role of corrosion in engineering materials
· Steel products
· Heat treatment of steels
· Carbon and alloy steels
· Tool steels
· Stainless steels
· Aluminum and its alloys
· Surface engineering
· The methodology of material selection

1. Course number and name: **MET 3300 Computer Programming Applications of Mechanical Engineering Technology**

2. Credit hours: 3

3. Instructor: Spencer Petersen

4. Textbook: MATLAB for Engineers, 5^{th} ed.

5. Specific course information:

    a. Catalog description:

       Applications of computer programming and computer software to problems in mechanical engineering technology. Lecture plus computer-based laboratory work.

    b. Prerequisite: MFET 2300 – Statics and Strength of Materials

    c. Required (R), Elective (E), or Selected Elective (SE): R

6. Specific goals for this course:

    a. Learning outcomes:

       Successful completion of the course objectives will give the student skill sot use MATLAB as an analysis tool for:

       - Engineering problems
       - Displaying results in graphs
       - Writing interactive programming code to solve iterative and repetitive problems

    b. Applicable student outcomes: 1 (medium applicability); 2, 3, 4, 5 (low applicability)

7. List of topics covered:

    a. MATLAB in general
    b. Built in functions
    c. Manipulating matrices
    d. Plotting
    e. User defined functions
    f. User controlled input and output
    g. Logical functions and selection structures
    h. Repetition structures

1. Course number and name: MET 3400 Machine Design

2. Credit hours: 3 engineering
   Contact hours: 3 engineering

3. Instructor: Dustin Birch

4. Textbook:

   Title: Machine Elements in Mechanical Design, 6^{th} Ed.
   Author: Mott, Vavrek, Wang
   Publisher: Pearson
   Year: 2018

5. Specific course information:

   a. Catalog description:

      Application of engineering technology fundamentals to machine design. Techniques involved in designing and selecting individual machine parts.

   b. Prerequisites or co-requisites:

      MFET 2300 – Statics and Strength of Materials or MFET 2310 – Statics for Engineering Technology and MFET 2320 Mechanics of Materials

   c. Required (R), Elective (E), or Selected Elective (SE): R

6. Specific goals for the course:

   a. Learning outcomes:

      – Perform engineering analysis of machines and mechanisms.
      – Apply mechanics of materials principles to the design of machine elements.
      – Perform engineering analysis of belts, chains, gears, shafts, keys, splines, bearings, and fasteners.
      – Understand fits, clearances, and component tolerancing, and how these concepts relate to mechanism design and assembly.

b. Applicable student outcomes (ETAC - Criterion 3): 1, 2

7. List of topics covered:

a. Basic machine overview
b. Properties of materials in machine design
c. Stress and deformation analysis of machine components
d. Belt design
e. Chain design
f. Gear design
g. Key design
h. Coupling and seal applications
i. Shaft design
j. Tolerancing, fits, and clearances in machine components
k. Roller bearing design
l. Journal bearing design
m. Fastener design and selection

ABET Course Syllabus

1. MET 3500, Mechanical Measurement and Instrumentation, Fall 2020

2. 3 Credit Hours – Schedule: Tue., Thu. From 1:30-2:45 pm

3. Instructor – Randy C. Hurd, PhD

4. Text – Mechanical Measurements, 6th Edition by Beckwith, Marangoni & Lienhard, Pearson

5. Specific Course Information

   a. Principles of temperature, pressure, strain, flow, force, and vibration measurements. Techniques of computerized data acquisition and reduction. Students will learn how to specify instrumentation systems, take data and interpret the results. Lecture plus laboratory work in selected topics.

   b. Prerequisites: EET 1850 – Industrial Electronics,
   MFET 2300 – Statics and Strength of Materials

   c. Required Course

6. Course Goals

a. Student Outcomes: At the end of the course, students will be able to

   i. select an appropriate instrument to collect specific measurements
   ii. quantify and interpret measurement uncertainty
   iii. apply fundamental measurement and uncertainty standards
   iv. quantify measuring system response parameters
   v. apply fundamental signal conditional and data post-processing techniques
   vi. use data acquisition and postprocessing software such as LabVIEW

b. ABET Outcomes

Students fulfill student outcome (1), an ability to apply knowledge, techniques, skills and modern tools or mathematics, science, engineering and technology to solve well-defined engineering problems appropriate to the discipline. Students fulfill this outcome through collecting data, post-processing data using Python, calculating measurement uncertainty, and calculating parameters and analyzing trends to solve engineering problems.

Students fulfill student outcome (3), an ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments. Students fulfill this outcome through bi-weekly lab reports where they are graded not only on finding the correct answer, but also on the quality of their writing and data presentation. The course also requires students to give a presentation describing how a particular instrument works along with its strengths and weaknesses. This assignment provides an opportunity for student to apply their oral communication skills.

7. Topics Covered:
   a. Instrument and measurement basics
   b. Measurement standards
   c. Basic statistics – mean, standard deviation, probability and confidence
   d. Measurement uncertainty – bias and random components
   e. Harmonic signals
   f. Measurement system response parameters
   g. Sensors
   h. Signal Condidtioning
   i. LabVIEW
   j. Fundamental instruments (thermocouples, strain gauges, etc.)

1. Course number and name: MET 3700 Testing and Failure Analysis

2. Credit hours: 3 engineering
   Contact hours: 3 engineering

3. Instructor: Dustin Birch

4. Textbook: None

5. Specific course information:

   a. Catalog description:

      Mechanical testing of materials, fatigue, fracture, wear, corrosion, embrittlement, failure mechanisms and analysis, case studies of failures.

   b. Prerequisites or co-requisites:

      MET 3150 – Engineering Technology Materials, MFET 2300 – Statics and Strength of Materials

   c. Required (R), Elective (E), or Selected Elective (SE): R

6. Specific goals for the course:

   a. Learning outcomes:

- Understand fundamental materials science and strengths of materials concepts.
- Understand and calculate material fatigue.
- Understand the concepts of fatigue crack growth and fracture mechanics.
- Understand the fundamentals of temperature based material failure including creep.
- Understand the fundamentals of material corrosion.
- Understand basic tribology including concepts of friction and wear.
- Understand the application of testing standards (ASTM)
- Perform laboratory material tests per published standards.

   b. Applicable student outcomes (ETAC - Criterion 3): 1, 3, 4

7. List of topics covered:

    a. Material failure criteria
    b. Metal fatigue
    c. Fracture mechanics
    d. Cycle counting / Unsteady loading
    e. Tribology
    f. Corrosion
    g. Temperature factors in material durability / Creep
    h. Material inspection techniques
    i. Fail safe techniques
    j. Error proofing designs
    k. Quality engineering techniques
    l. Failure analysis techniques
    m. Engineering ethics introduction

Weber State University

1. Course number, name: MET 4200 Mechanical Design with FEA

2. Credit hours: 3 credits hours
   Contact hours: 3 contact hours

3. Instructor Dr. Daniel J. Magda

4. Textbook:

   Handouts and Tutorials with PDF support materials below
   PDF Workbench User Guide, PDF Mechanical User Guide, PDF Meshing User Guide. All support material and lectures will be on Canvas.

5. Specific course information

   a. Brief description of the content of the course

   Application of engineering technology fundamentals in mechanical design using Finite Element Analysis. Lecture plus computer-based laboratory work.

   b. Prerequisites or co-requisites

   MET 3400 and MFET 2300

   c. Required (R)

6. Specific goals for the course:

   a. Specific outcomes of instruction

   · Students will understand the process and fundamentals of FEA
   · Students will understand the global stiffness matrix for nodes and elements
   · Students will be able analyze 2-D and 3-D geometric models with ANSYS Workbench Software.
   · Students will be able to import models from SOLIDWorks,Solid Modeler, CATIA etc. into ANSYS Workbench.
   · Students will be able to mesh the model into finite elements and nodes.
   · Students will be able to apply boundary conditions to the model (forces, moments, restraints).
   · Students will understand bonded and no separation connections in assemblies
   · Students will be able to solve for stresses, strains and deflections
   · Student will be able identify singularities and stress concentrations
   · Students will be able to understand convergence criteria's

b. Explicity indicate which of the student outcomes listed within criterion 3 or any other outcomes are addressed by the course

   outcome #1

7. Brief list of topics to be covered

   · Intro-review of structural mechanics
   · Failure criteria's
   · Global stiffness matrix
   · Introduction to ansys workbench
   · Introduction to ansys simulation
   · Engineering material data library
   · Pre-processing and name selections
   · Pre-processing and object generator
   · Meshing techniques
   · Error analysis
   · Convergence & stress singularity
   · Static structural analysis
   · Mesh evaluation
   · Post processing

1. Course number and name: **MET 4500 Senior Project**

2. Credit hours: 3 credit hours
   Contact hours: 3 hours

3. Instructor: Dr. Tariq Arif

4. Textbooks: None

5. Specific course information

   a. Catalog description

      A mechanical engineering technology project will be selected for team participation. Projects will require planning, analysis, design, development, production, testing, and documentation.

   b. Prerequisite: MET 4200 - Mechanical Design with FEA

   c. Required (R), Elective (E), or Selected Elective (SE): R

6. Specific goals for the course

   a. Specific outcomes of instruction

      - apply fundamental engineering principles to design.

      - Identify customer/sponsor needs and translate these needs to engineering specifications.

      - Develop an understanding of project management, including scheduling and coordination, leading to a functional prototype.

      - critically consider design alternatives

      - Work effectively in teams and performing individual roles required for a functioning design team.

      - support and evaluate design decisions using engineering principles

      - complete a project within time and budget constraints.

      - demonstrate oral and written communication skills

   b. Criterion 3 applicable student outcomes: 1, 2, 3, 5 (High applicability)

7. List of topics covered

   a. Design requirements and guidelines for team dynamics and meeting
   b. Design optimization techniques and risk analysis

c. Teamwork management using Team Charter, work breakdown structure, and Gantt charts.
d. Conceptual design reviews
e. Preliminary design reviews
f. Critical design reviews
g. Design report and presentation

1. Course number and name: **MET 4510 Senior Project**

2. Credit hours: 3 credit hours
   Contact hours: 3 hours

3. Instructor: Dr. Tariq Arif

4. Textbooks: None

5. Specific course information

   a. Catalog description

      A mechanical engineering technology project will be selected for team participation. Projects will require planning, analysis, design, development, production, testing, and documentation.

   b. Prerequisite: MET 4500 - Senior Project

   c. Required (R), Elective (E), or Selected Elective (SE): R

6. Specific goals for the course

   a. Specific outcomes of instruction

      - apply fundamental engineering principles to design.
      - Identify customer/sponsor needs and translate these needs to engineering specifications.
      - Develop an understanding of project management, including scheduling and coordination, leading to a functional prototype.
      - critically consider design alternatives
      - Work effectively in teams and performing individual roles required for a functioning design team.
      - support and evaluate design decisions using engineering principles
      - complete a project within time and budget constraints.
      - demonstrate oral and written communication skills

   b. Criterion 3 applicable student outcomes: 2, 3, 4, 5 (High applicability)

7. List of topics covered

   a. Design requirements and guidelines for team dynamics and meeting

b. Design optimization techniques and risk analysis
c. Teamwork management using Team Charter, work breakdown structure, and Gantt charts.
d. Prototype testing and analysis
e. Design report and presentation

1. Course number and name: MET 4650 Thermal Science

2. Credit hours: 3 engineering
   Contact hours: 3 engineering

3. Instructor: Dustin Birch

4. Textbook:

   Title: Introduction to Thermal and Fluids Engineering 1st Ed.
   Author: Kaminski, Jensen
   Publisher: Wiley
   Year: 2011

5. Specific course information:

   a. Catalog description:

      Application of engineering technology fundamentals to machine design. Techniques involved in designing and selecting individual machine parts.

   b. Prerequisites or co-requisites:

      MATH 1210 – Calculus I and PHYS 2210 – Physics for Scientists & Engineers I, and CHEM 1110 – Elementary Chemistry or CHEM 1210 – Principles of Chemistry I.

   c. Required (R), Elective (E), or Selected Elective (SE): R

6. Specific goals for the course:

   a. Learning outcomes:

      – Understand the theory and application of thermal science.
      – Understand the concepts of work and energy.
      – Understand conservative laws of physics.
      – Understand basic thermodynamic power, refrigeration, and heat pump cycles and their applications.
      – Understand fundamental heat transfer concepts and their application in thermal science.

- Understand fundamental fluid mechanics concepts and their application in thermal science.
- Understand heat exchangers.

b. Applicable student outcomes (ETAC - Criterion 3): 1

7. List of topics covered:

a. First law of thermodynamics
b. Second law of thermodynamics
c. Properties of matter
d. Application of energy equation to open closed systems
e. Basic thermodynamic cycles including the Carnot cycle
f. Refrigeration and heat pump cycles
g. Power cycles (Rankine, Brayton, Otto, and Diesel)
h. Fluid mechanics basics
i. Internal flows
j. External flows
k. Introduction to compressible flow
l. Heat transfer basics
m. Conduction heat transfer overview
n. Convection heat transfer overview
o. Radiation heat transfer overview
p. Heat exchanger design
q. Special topic – gas turbine engine cooling design

1. Course number and name: MET 4990 Seminar in Mechanical Engineering Technology

2. Credit hours: 1 engineering
   Contact hours: 1 engineering

3. Instructor: Dustin Birch

4. Textbook:

   None

5. Specific course information:

   a. Catalog description:

      Guest lectures from local industry, professionalism and engineering ethics, technology and society, and employment preparation.

   b. Prerequisites or co-requisites:

      MET 4500 – Senior Project

   c. Required (R), Elective (E), or Selected Elective (SE): R

6. Specific goals for the course:

   a. Learning outcomes:

   – Understand the basic elements related to job searching and applying for professional positions in industry.
   – Understand basic professional and engineering ethics, including and understanding of responsibilities for the safety of engineered products and systems.
   – Understand how to perform searches for appropriate peer reviewed technical literature.
   – Understand the benefits of professional societies, professional licensure, and avenues to advanced training and education in engineering science.

   b. Applicable student outcomes: 3

7. List of topics covered:

    a. Career services – resumes, interviews, job seeking
    b. Workplace diversity
    c. Professional ethics, professionalism
    d. Lifelong learning
    e. Basics of intellectual property
    f. Weber State University MBA program introduction
    g. Exit exam preparation and review
    h. Industry guest speakers (aerospace, industrial equipment, design software development)

WEBER STATE UNIVERSITY
MANUFACTURING ENGINEERING TECHNOLOGY (MFET)
COURSE SYLLABUS

1. Course number and name: MFET 1210/1210L Machining Principles lecture/lab

2. Categorization of credits: Three (3) credits – Two, 2-1/2 hour lecture/labs per week

3. Instructors: Kerry Tobin, Phone: (801) 626-6921, ktobin@weber.edu, Justin Knighton, Phone: (801) 626-6378, justinknighton@weber.edu, Sam Hunter, Phone: (801) 626-8570, samuelhunter@weber.edu, Office Hours by appointment as posted.

4. Text: Machine Tool Practices (kibbe, 9th edition or newer)
   Workbook: MFET 1210/1210L
   Other supplementary materials: 6" scale/ruler 1/32" & 1/64" increments, Safety glasses, Combination or key-type lock (for locker use)

5. Specific course information
   a. Course Description (catalog); Introduction to machining processes through theory and practice including: setup and operation of the engine lathe & milling machine, machine and tool performance, inspection techniques, basic blueprint reading, process planning. Students will utilize lab time to complete assignments as requires. One lecture per week and two three-hour labs per week required
   b. Prerequisite: None
   c. This is a required course for all MFET, MET and PDD areas.

6. Specific goals for the course:
   a. Course Objectives - Of all the manufacturing processes, machining technology will always remain among the most important. This course is designed to introduce students to machining technology and other manufacturing processes. A working knowledge of the machining processes and related subjects offered in this course will provide an excellent fundamental technical foundation on which to build exciting careers in manufacturing/mechanical engineering technology, engineering graphics and design, or machining technology.
   b. Student Learning Outcomes (LO's) Supported:

      LO 1; An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, or technology related to materials, manufacturing processes, tooling, automation, production operations, maintenance, quality, industrial organization and management, and statistics to solve broadly defined engineering problems. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.

      LO 4; An ability to function effectively as a member or leader on a technical team

7. Specifically, students will be able to do the following:
   a. Demonstrate the ability to understand and use safety concepts associated with a machine shop environment.

b. Demonstrate an ability to function properly in an industrial environment. This includes attend class regularly, being on time, keeping the work area clean after shop usage, and returning all tools properly.
c. Demonstrate the ability to read and understand simple engineering drawings.
d. Demonstrate the ability to use hand and power tools with their various uses.
e. Demonstrate the ability to setup and safely operate an engine lathe, milling machine & power saws to produce close tolerance parts with high quality surface finishes.
f. Demonstrate the ability to calculate proper speeds and feeds for efficient and economical production of parts.
g. Demonstrate the ability to perform and understand chip loading on cutting tools and machines.
h. Demonstrate the ability to correctly use a wide variety of inspection devices and methods to insure and control quality of machined parts.
i. Demonstrate the ability to understand and use proper terminology used in the machining processes environment.

Weber State University
Manufacturing Systems Engineering
Course Syllabus

1. MFET 2300 Statics & Strength of Materials

2. 5 Credit hrs, 5 Contact hrs in classroom instruction; Spring & Fall

3. Instructor: Kelly A Harward

4. Required Textbook: Statics and Mechanics of Materials, R.C. Hibbeler 5th Edition, 2017

a. Other Supplemental Materials: CANVAS documents: Instruction Videos, Example Quizzes & Tests, PowerPoint Class Presentations, Calculator Programs, Assignment Schedules.

5. Specific course information, Other required tools: Programmable Calculator, Laptop or iPad with WiFi for Internet access during class time.

a. Course Description: Principles of forces, moments, resultants & static equilibrium of force systems, center of gravity, friction, and free body diagram analysis. Also concept of stress and strain, shear, bending moments, torsion, bending stresses in beams and stress resolution and shear.

b. Pre-requisite(s): PHYS 2010/L or PHYS 2210/L; MATH 1060 or MATH 1080 or MATH 1210.

c. This is a required course in MFET

6. Specific goals for the course: To give to the student a basic understanding of the principles of statics (equilibrium of rigid bodies under the action of balanced forces) and strength of materials (relationships among the external forces applied to the bodies, the resulting stresses and deformation and the determination of the proper sizes of structural members to satisfy strength and deformation requirements.)

a. Upon completion of the course the student will be able to use the appropriate terminology, symbolism, equations, & calculations to resolve statics and strength of materials problems.

b. Criterian 1: An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering & technology to solve statics & strength of materials problems in Manufacturing Engineering Technology specific to the program's emphases in Production Operations and Controls, Plastics and Composites, and Welding related to current manufacturing systems design, operations, quality and continuous improvement.
Criterian 2: An ability to design components meeting specified needs for engineering problems relating to solve statics & strength of materials in Manufacturing Engineering Technology specific to the program's emphases in Production Operations and Controls, Plastics and Composites, or Welding.

7. Brief list of topics to be covered:

- Recognize the presence of forces on static bodies
- Resolve forces & moments using vector quantities
- Define vectors in terms of position, unit, and Cartesian vectors
- Calculate dot and cross product of vectors and know the applications
- Draw free body diagrams of statically determinate structures
- Apply equilibrium equations (forces & moments) to solve for the unknown forces
- Describe equilibrium conditions of systems (frames, trusses, machines, etc.)
- Analyze forces in trusses, beams and frames (2D and 3D spatial problems)
- Determine centroid and center of gravity of a body or cross-section (Calculator & CAD)
- Determine area moments of inertia of a cross-section
- Recognize the presence of forces on bodies and determine effects on the material
- Determine stress and strain for axial loads
- Determine stress and strain for torsional loads
- Determine shear forces, and bending moments in beams
- Determine deflections of beams due to bending
- Size beams, trusses, frame members, and connectors based on loads and materials.

ABET Course Syllabus

1. MFET 2360 - Manufacturing Processes and Materials, Spring 2021

2. 3 Credit Hours – Schedule: Tue., Thu. From 1:30-2:45 pm

3. Instructor – Mary Foss

4. Text – Manufacturing Engineering and Technology, S. Kalpakjiam, S. Schmid.

5. Specific Course Information

    a. Survey of industrially important processes used to change material shape and condition for industrial use. Survey of industrially important materials and the principles of material behavior. Lecture plus laboratory work in selected topics.

    b. Prerequisites: None

    c. Required Course

6. Course Goals

a. Student Outcomes: At the end of the course, students will be able to

i. Understand the basic mechanical and chemical properties of engineering materials.
ii. Understand basic manufacturing processes including; casting and foundry processes, metal joining processes. metal forming processes, sheet metal working processes, powder metal processes, basic polymers and polymer processes, metal removal processes, basic design for assembly techniques
iii. Understand overall process capabilities of industrial significant processes (surface finish and tolerance capability)
iv. Identify appropriate manufacturing methodologies for a given product based on: process capabilities and design requirements

b. ABET Outcomes

Students fulfill student outcome (1), an ability to apply knowledge, techniques, skills and modern tools or mathematics, science, engineering and technology to solve well-defined engineering problems appropriate to the discipline. Students fulfill this outcome through learning conceptual content related to engineering materials and manufacturing processes and then applying this learning in the evaluation of the suitability of different materials and processes to meet design requirements.

Students fulfill student outcome (3), an ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments. Students fulfill this outcome through lab reports where they are graded not only on finding the correct answer, but also on the quality of their writing and data presentation. The course also requires students to write a report and give a presentation describing how a chosen product is manufactured and the materials that are involved in the product. This assignment provides an opportunity for students to improve upon their written communication skills as well as their oral communication skills.

7. Topics Covered:

a. Introduction to Manufacturing
b. Mechanical and physical properties of materials
c. Structures of metals
d. Ferrous and nonferrous metals
e. Heat treatment processes
f. Surface treatment processes
g. Polymers
h. Ceramics
i. Composites
j. Tolerances and GD&T
k. Additive Manufacturing
l. Material Selection for Design
m. Manufacturing processes including; Injection molding, machining, turning, hole making, casting, welding, forging, sheet metal processes, bulk forming, extrusion and drawing, powder metallurgy, composite lay-up

WEBER STATE UNIVERSITY
MANUFACTURING ENGINEERING TECHNOLOGY (MFET)
COURSE SYLLABUS

1. Course number and name: MFET 3340/3340L Applied Fluid Power

2. Categorization of credits: Three (3) credits – Two, 50 minute lectures and one – 2 hour lab

3. Instructors: Kerry Tobin, Phone: (801) 626-6921, ktobin@weber.edu, Office Hours by appointment as posted.

4. Text: FLUID POWER WITH APPLICATIONS, 6th or 7th edition, by Anthony Esposito, Prentice-Hall Inc., Englewood Cliffs, NJ.
   Student Lab Manual APPLIED FLUID POWER by Kerry Tobin, edited by Roger Anderson (Purchase from WSU Book Store)
   Other supplementary materials: Safety glasses

5. Specific course information
   a. Course Description (catalog); MFET 3340 - Principles of fluid mechanics and component operation as they apply to the design of hydraulic and pneumatic systems. Computer programs may be used to analyze and design systems.
      MFET 3340L - Application of the theory taught in MFET 3340.
   b. Prerequisite: MFET 2300 or MFET 2320 or ENGR 2010 and ENGR 2140; PHYS 2010/L or PHYS 2210/L.
   c. This is a required course for MFET Plastics and Composites Emphasis, Production Operations and Control Emphasis, and all MET areas.

6. Specific goals for the course:
   a. Course Objectives – The fluid power principles learned in this class may be used in the Senior Project classes depending upon the selected project. A working knowledge of fluid power will help to provide a foundation on which to build exciting careers in Manufacturing Engineering Technology.
   b. Student Learning Outcomes (LO's) Supported:

      LO 1; An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, or technology related to materials, manufacturing processes, tooling, automation, production operations, maintenance, quality, industrial organization and management, and statistics to solve broadly defined engineering problems. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
      a. The student shall have a thorough understanding of the terminology used in the fluid power industry, to adequately describe all the common fluid power components and equipment.
      b. The student will be able to draw and interpret a fluid power circuit diagram made up of ANSI fluid power symbols.
      c. Reference books, related journals, standards and specifications associated with design and development are included.

LO 2; An ability to design systems, components or processes meeting specified needs for broadly defined engineering problems.

LO 4; An ability to function effectively as a member or leader on a technical team.

a. The student shall work as teams consisting of about 3 students, on lab assignments.

LO 5; An ability to apply written, oral, and graphical communication in both technical and nontechnical environments; and an ability to identify and use appropriate technical literature.

a. The student shall be able to write weekly professional level reports to describe and utilize the capabilities while recognizing and minimizing limitations of fluid power systems.

7. Specifically, students will be able to do the following:
   a. Demonstrate the ability to understand and use safety concepts in the use of fluid power equipment in test bench experiments.
   b. Demonstrate the ability to use established formulas calculate hydraulic and pneumatic energy, power and pressures with losses in circuits
   c. Demonstrate the ability to use conductors, fittings, pumps, compressors, actuators, motors, directional and flow control valves.
   d. Demonstrate an ability to function properly in an industrial environment. This includes attend class regularly, being on time, keeping the work area clean after shop usage, and returning all tools properly.
   e. Demonstrate the ability to understand physical properties of hydraulic fluid.
   f. Demonstrate the ability to read, draw troubleshoot circuit diagrams using VISIO or equivalent computer software.
   g. Demonstrate the ability to work as a team member of a lab group that compiles lab experiments into written reports that are industry content and quality.
   h. Demonstrate the ability to understand and use proper terminology as used in an industrial environment.

PDD 1010: Introduction to Engineering & Technical Design (SolidWorks)

Credits and contact hours: 3 credit hours, MWF 12:30 – 1:20 PM Engineering Technology 126

Instructor’s name: Glen West

Textbook: None

Other supplemental materials: None

Specific course information

a. Catalog Course Description:

   An introductory course to explore engineering and technical design solutions using critical thinking in Science, Technology, Engineering and Mathematics. Topics include Engineering Design Processes & Professions, Sketching and Documentation, Design Measuring, Introduction to CAD and Geometric Constraints, Design Visualization, Orthographic Projection and Multi-View Drawings, Fasteners, Assembly Drawings, Dimensioning, and Tolerancing

b. prerequisites: None

c. Required for PDD, MET, and MFET majors

Specific goals for the course

ABET – Student Learning Outcomes:

1. An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, or technology related to materials, manufacturing processes, tooling, automation, production operations, maintenance, quality, industrial organization and management, and statistics to solve broadly defined engineering problems. This Learning Outcome also represents MFET Program Criteria. Previous ABET Learning Outcomes a, b, and f have been combined into this Learning Outcome.

2. An ability to design systems, components or processes meeting specified needs for broadly defined engineering problems. This was ABET Learning Outcome e.

Topics:

- Design Visualization
- Engineering Geometry and Construction
- Three-Dimensional Modeling
- Multi-View Drawings
- Axonometric and Oblique Drawings
- Perspective Drawings
- Auxiliary Views
- Section Views
- Dimensioning and Tolerancing Practices
- Fastening Devices and Methods
- Working Drawings

APPENDIX B – FACULTY VITAE

APPENDIX B – FACULTY VITAE

1. **Name: Daniel J. Magda, Ph.D.**

2. **Education:**

- Doctor of Philosophy, Mechanical Engineering, University of Utah, 1995
- Master of Science, Mechanical Engineering, University of Utah, 1990
- Bachelor of Science, Mechanical Engineering, University of New Hampshire, 1984
- Associate of Science, Machining & Manufacturing Processes, Keene State College, 1979

3. **Academic experience:**

- Weber State University, *Professor*, 2010 – present, Department Chair 2019 – present, FT
- Weber State University, *Associate Professor*, 2004-2010, FT
- Weber State University, *Assistant Professor*, 1998 – 2004, FT
- Utah State University, *Visiting Professor*, (2013 – 2014) sabbatical, FT
- Utah State University, *Adjunct Professor*, (2014 – 2015), PT

4. **Non-Academic experience:**

- Collaboration with WSU Zoology Department and Dr. Markus Mika, Ph.D. from the University of Wisconsin La Crosse. The objective of this project was to design and build a remote-controlled device to seal off the opening of bird nesting boxes 2015-2016, PT
- QENERGY INC. *Engineering Consultant*, research the effect of glycol solution with corrosion inhibitor and oxygen scavengers on their PCK thermal engine. 2015, PT
- INFINIA INC. *Engineering Consultant*, Corrosion research and life prediction of Power Dish IV heat transfer units, 2013, PT
- INFINIA INC. *Engineering Consultant*, Designed and built strain gage data acquisition system for the Power Dish IV heat transfer units, 2012, PT
- UCAID, *Engineering Consultant*, Research and test results for stress corrosion cracking on aircraft landing gear materials, 2011, PT
- UCAID, *Engineering Consultant*, Report and findings of the failure analysis of a helicopter gearbox bearing thrust plate 2010, PT
- JETWAY INC. *Mechanical Engineer*, FEA analysts Designed and analyzed large frame weldments, structures and chassis assemblies using the finite element software, ANSYS, 2006-2007 (sabbatical), FT
- ARROW DYNAMICS INC. *Mechanical Engineer*, Roller coaster design 1996-1998, FT

5. **Certifications or professional registrations:**

- Certification training in ANSYS FEA workbench 2015

6. **Current membership in professional organizations:**

7. Honors & awards:

- Awarded Alan E. and Jeanne N Hall Endowment Grant for Community Outreach, awarded $3,600, 2018
- Awarded Moyes Academic Support and Technology Endowment (ASTEC) Grant, awarded $1,600, 2108
- Awarded the Weber State University *"Outstanding Undergraduate Research Mentor Award"* from President Wight and the Office of Undergraduate Research, 2013.
- Grant $4,575, Improved Performance of a Small Internal Combustion Engine, Undergraduate Research Grant Committee, 2010
- Grant $2,980, Capstone Design Competition for Society of Automotive Engineers (SAE) RS & PG, WSU, 2008
- Selected to the United Who's who Executive Registry for leadership achievement in the engineering community, 2004

8. Service activities:

- NOORDA engineering steering committee 2019 – present
- Chair of ME search committee
- ASME advisor 2018 - 2019
- Ritchey Science Fair committee 2016 - present
- Promotion and Tenure Committee, 2015
- Weber State University Salary Budget and benefits committee 2013
- Undergraduate Research committee 2004 – 2010
- Research Scholarship & Professional Growth (RSPG), 2008 – 2009
- MET Program Coordinator 2006 – 2013
- Mentor for 30+ undergraduate students 2004 – present

9. Publications & presentations:

- "*Technique of Quantifying Residual Stresses and their Effects on Surface Integrity*" ASEE paper and conference presentation, 2013
- *"Teaching Demo to Reinforce how Mechanical Properties Change Due to Heat Treatment Processes"*, ASEE paper and conference presentation, 2012

10. Professional development activities:

- Attended five seminars at the ASEE conference on teaching, learning New Orleans 2016
- Member of the "Round table Group" A U.S. private consulting firm
- President APEX Engineering & Consulting LLC.
- Sabbatical leave to Utah State University 2013 – 2014,

Managed 12+ different Capstone design projects and two Air Force research design competition (AFRL)

1. Name **Kirk D. Hagen**

2. Education

PhD	Mechanical Engineering	University of Utah	1989
MS	Mechanical Engineering	Utah State University	1980
BS	Physics	Weber State College	1977

3. Academic Experience

Weber State University	Professor & Chair, Engineering	2011 - present	FT
Weber State University	Asc. Prof. Coordinator, Pre-eng	1996 - 2001	FT
Weber State University	Asst. Prof. Coordinator, Pre-eng	1993 - 1996	FT
Bucknell University	Visiting Asc. Prof.	2000 - 2001	FT
Salt Lake Com. College	Adjunct Instructor	1992 - 1993	PT
University of Utah	Adjunct Instructor	1983, 2000	PT

4. Non Academic Experience

- GXX Corporation Consulting Engineer/Designer	2011	PT
- JBT Aerospace Ogden, Utah Consulting Engineer Thermal Analyst	2009	PT
- Ogwa, Pleasant Grove, Utah Consulting Engineer/Designer	2009	PT
- Kahuna Creations Ogden, Utah Consulting Engineer/Designer	2008	PT
- Unisys Corporation, Salt Lake City, Utah Consulting Engineer, Thermal Designer/Analyst	1993, 1994	PT
- Unisys Corporation, Salt Lake City, Utah Principal Engineer, Thermal Designer/Analyst	1986 - 1992	FT
- Hercules Aerospace, Salt Lake City, Utah Principal Engineer, Thermal Analyst	1980 - 1986	FT

5. Certifications or Professional Registrations None

6. Current Membership in Professional Organizations

American Society of Mechanical Engineers (ASME)	1986 - present
American Society for Engineering Education (ASEE)	1993 - present

7. Honors and Awards

WSU Brady Presidential Distinguished Professor	2014
Hemingway Collaborative Award	2011
Hemingway Faculty Vitality Award	1996

8. Service Activities (within and outside the institution)

Within WSU

Faculty Board of Review (chair)	2015 – 2017
APAFT Committee	2012 - 2015
Research, Scholarship & Professional Growth Committee	2009 - 2012
University Planning Council	2009 - 2011
University Curriculum Committee	2007 - 2010
College Promotion & Tenure Committee	2002, 2004, 2010, 2011
University Committee on Assessment	2001 - 2003
Faculty Senate	1996 - 1999

Outside WSU

Subject Matter Expert, McGraw-Hill Higher Education	2017 - present
Journal of Engineering Technology Reviewer	1998 - present

9. Publications and Presentations in the Last Five Years

Kirk D. Hagen, *Introduction to Renewable Energy for Engineers*, Pearson, 2016.

Kirk D. Hagen, *Introduction to Engineering Analysis 4th Edition*, Pearson Prentice Hall, 2015.

Hagen, K.D., "Senior Projects as a Means of Building Engineering Laboratories", Joint International Conference on Engineering Education and Information Technology, Capetown, South Africa, 2013.

Hagen, K.D., "A Contextual Engineering Laboratory: Heat Transfer via Thermal Behavior of Electronics", International Conference on Engineering Education and Research, Marrakesh, Morocco, July 2013.

Kirk D. Hagen, *The First Engineering Program at Weber State University: Expectations and Challenges*, ASEE Rocky Mountain Region presentation, March 2012.

Kirk D. Hagen, *Thermal-Fluid Science Laboratory Development at Weber State University*, ASEE Rocky Mountain Region paper, March 2012.

10. Recent Professional Development Activities

ABET Annual Conference and Workshop	Baltimore, MD	2011
The Teaching Professor	Kissimmee, FL	2008

1. **Name:** Dustin Scott Birch, P.E.

2. **Education:**
    - Doctor of Philosophy - Candidate, Systems Engineering, Colorado State University (Scheduled Completion - August 2021)
    - Master of Science, Mechanical Engineering, University of Utah, 2000
    - Bachelor of Science, Mechanical Engineering, University of Utah, 1997
    - Associate of Science, Design & Drafting Engineering Technology, Ricks College, 1992

3. **Academic Experience:**
    - Weber State University, Associate Professor, 2017-Present
    - Weber State University, Assistant Professor, 2011-2017

4. **Non-Academic Experience:**
    - Williams International, Consulting Engineer, 2011-2020. Thermal and structural analysis, aircraft engine component durability and fatigue lifing analysis, FAA certification plan and report preparation and editing.
    - ClearStream/PRE, Consulting Engineer, 2011-2020. Powertrain design, gear design, structural analysis, automated design tool development.
    - ClearStream, Director of Engineering, 2007-2011, Senior leadership of the corporate engineering team.
    - Williams International, Turbine Cell Manager, 2004-2007, Engineering and production management of a manufacturing group producing aerospace hardware for military and civilian aircraft engines.
    - Williams International, Engineering Specialist / Lead Engineer, 2000-2004, Mechanical design, manufacturing engineering, thermal and structural analysis of aerospace hardware, durability and fatigue lifing of aircraft engine components.
    - Engineering 4D, Engineer, 1998-1999, CAD software automation and design standardization.
    - Westech Engineering, CAD Designer / Engineer, 1993-1997, CAD design of industrial equipment, CAD software automation
    - Tetra Tech, CAD Designer / Engineering Technician, 1992-1993, CAD design and technical drafting.

5. **Certifications or Professional Registration:**
    - State of Utah – Licensed Professional Engineer (Mechanical Engineering: Machine Design and Materials), Registration # 323747-2202

6. **Current Membership in Professional Organizations:**
    - Senior Member AIAA (American Institute of Aeronautics and Astronautics) (1997-Present).
    - Member ASEE (American Society for Engineering Education) (2012-Present).

7. **Honors & Awards:**
    - RSPG Hemmingway Faculty Vitality Grant, 2020, $1,751.66, Concept Hybrid Rocket Demonstrator
    - OUR Kem and Carolyn Gardner Foundation, 2016, $2159.91, Solar Flight Drone

- OUR Denkers Family Foundation Grant, 2014, $3500.00, Tracker Jack Mobile Power Generating Unit
- OUR Ralph Nye Charitable Foundation, 2014, $3,500.00, Fatigue Testing Machine Demonstrator
- OUR Denkers Family Foundation Grant, 2013, $1934.00, SWIC (Solar Wind Generating Crate)
- RSPG Hemmingway Faculty Vitality Grant, 2012, $1975.00, Mobile Elemental Power Plant

8. Service Activities:

- Utah Partnership for Education, Board of Trustees Member, 2007-2018, Board Chairman 2009-2018.
- Weber State University Faculty Senate, Representing the College of Engineering, Applied Science, and Technology, 2019-Present
- Weber State University Salary, Benefits, Budget, and Fiscal Planning Committee, 2017
- Weber State University College of Engineering, Applied Science, and Technology Curriculum Committee, 2013-Present
- Weber State University Mechanical Engineering Technology Program Coordinator, 2014-2017
- Weber State University Mechanical Engineering Program Development Committee, 2017

9. Publications and Presentations:

Authored or Co-Authored Papers:

- "Open-Source Antenna Pattern Measurement System: Development and Applications" Hearn, Newton, Hansen, Birch, April 2021, IEEE Instrumentation and Measurement Society Journal – Manuscript Number TIM-21-01182, Submitted for Publication - 2021
- "Development of a Human Factors Hazard Model Using HEP/FTA/ETA", Birch, Bradley, AIAA-INCOSE: Wasatch Aerospace and Systems Engineering Mini-Conference, Presented & Published – 2021 (3rd Place Award in "Creating New Solutions)
- "Integration of Open-Source Antenna Pattern Measurement to Undergraduate Research", Hearn, Birch, AMTA, Published - 2020
- "Integrating MS Excel in Engineering Technology Curriculum", Birch, ASEE Paper ID# 11558, ASEE World Conference, Seattle, WA, Presented & Published - 2015
- "Multidisciplinary Mobile Elemental Power Plant", McCulley, Birch, Usui, Harward, ASEE Paper ID# 2012-4590, ASEE World Conference, San Antonio, TX, Presented & Published - 2012

10. Professional Development Activities:

- Chi Tester Training (2015)
- Canvas Training (2015)
- Manufacturing Engineering Technology, Machine Tool Operation Cross-Discipline Refresher Training, 2014
- Statistical Methods and Process Control Short Course (2007).
- Product Liability Short Course (2006).
- Advanced Geometric Dimensioning and Tolerancing Short Course (2003).
- University of Kentucky Lean Manufacturing Short Course & Simulation (2002).

1. **Name: Tariq M. Arif, Ph.D.**

2. **Education:**

   a) Doctor of Philosophy, Mechanical Engineering, New Jersey Institute of Technology (NJIT), NJ, USA, 2017.
   b) Master of Science, Mechanical Engineering, University of Tokushima, Tokushima, Japan, 2011.
   c) Bachelor of Science, Mechanical Engineering, Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh, 2005.

3. **Academic experience:**

   a) Weber State University, Ogden, UT, USA, *Assistant Professor*, July 2019 – present, FT.
   b) University of Wisconsin, Platteville, WI, USA, *Lecturer*, Jan 2017 – June 2019, FT.
   c) New Jersey Institute of Technology (NJIT), NJ, USA, *Teaching Assistant*, Sep 2012 – Dec 2016, PT.
   d) University of Tokushima, Tokushima, Japan, *Teaching Assistant*, Apr 2010 – Sep 2011,
   e) New Jersey Institute of Technology (NJIT), NJ, USA, *Research Assistant*, Focused ultrasound simulation in heterogeneous tissue media, analyze wave pattern of the ultrasound beam, Numerical data analysis by Genetic Algorithm (GA), Sep 2012 – Dec 2016, PT.

4. **Non-Academic experience:**

   a) Nissan Motor Corp., Ltd. Atsugi, Japan, *Technical Consultant* (Contract Position by Sun Well Corp., Ltd), Support to Nissan's Siemens PLM software users and CAD/CAE designers with operational uses of UGS NX. Customize macro programs to support design evaluation, Oct 2011 – Aug 2012
   b) SUZUKI Motor Corp., Head Office, Hamamatsu, Japan, *CAD/CAE Engineer*, 3D modeling, 2D drafting, and DMU Assembly through UGS NX and Teamcenter, Structural Analysis (ANSYS, MSC Nastran, and NX Nastran) and design optimization, Feb 2007 – Jun 2009.
   c) SAF International Ltd., Dhaka, Bangladesh, *Service Engineer*, 2D/3D Piping layout design during installation and commissioning of HVAC equipment, Load calculation for designing industrial waste heat co-generation system, Feb 2006 – Aug 2006.

5. **Certifications or professional registrations:**

   a) JLPT-N4 Certification (Level-3), Japanese Language Proficiency Exam, Dec 2010.

6. **Current membership in professional organizations:**

   a) American Society of Mechanical Engineers (ASME)

7. **Honors & awards:**

a) RSPG Grant for Facilitating Experiential Learning Online, Jun 2020 (Awarded $1725.10)
b) Presidential Teaching Innovation grant by Research, Scholarship, and Professional Growth (RSPG), 2020. (Awarded $2290)
c) GSA Special Achievement award at NJIT for ASME 2014 Nov meeting, 2015. (Awarded $1000)
d) Japanese Government Monbukagakusho Honors Scholarship (JASSO), Japan, 2011. (Awarded $3600)

8. Service activities:

a) MET Program Co-Program Coordinator, Aug 2020 to present.
b) ASME faculty advisor, Weber State University, Sep 2019 – present.
c) EAST Scholarship Committee, Weber State University, Jan 2020 – present.
d) Faculty Senate, Environmental Issues Committee (EIC), Aug 2020 to present.
e) Member of Diversity and Inclusion Committee, Nov 2020 to present.
f) ME search committee, Weber State University, 2020.
g) Served as a judge for the NSF Student Poster Competition, 2019 ASME International Mechanical Engineering Congress and Exposition, UT, Nov 10-13, 2019.

9. Publications & presentations:

a) Tariq M. Arif, "*Introduction to Deep Learning for Engineers: Using Python and Google Cloud Platform*", Morgan & Claypool, 2020, ISBN: 9781681739151.
b) Tariq M. Arif, Zhiming Ji, "*A Fast Estimation Model for Angular Spectrum Based Focused Ultrasound Wave Simulation in Layered Tissue Media*", ASME 2019 International Mechanical Engineering Congress and Exposition (IMECE 2019), Vol 3: Biomedical and Biotechnology Engineering, Salt Lake City, UT, USA, November 2019.
c) Tariq M. Arif, Zhiming Ji, "*Rapid approach to the determination of Rayleigh-Sommerfeld response field for focused ultrasound simulations*", Poster presented at Annual Research Day, New Jersey Institute of Technology, Newark, NJ, Nov 2016.
d) Tariq M. Arif, Zhiming Ji, "*Design Optimization of Ultrasonic Transducer Element by Evolutionary Algorithm*", ASME 2014 International Mechanical Engineering Congress and Exposition (IMECE 2014), Volume 11: Systems, Design, and Complexity, Canada, November 2014.
e) Teruaki Ito, M. Tomotoshi and Tariq M. Arif, "*A study on intuitive manipulation methods for remote usage of robotic arm*", Proceedings of JSME Manufacturing Systems Division, Musashi University, Tokyo, Japan, Vol.12, No.7, pp.69 – 70, Mar 2012.
f) Tariq M. Arif, Teruaki Ito, "*Master-Slave robotic arm manipulation for communication robot*", Proceedings of JSME annual conference, Tokyo Institute of Technology, Tokyo, Japan, Vol.11, No.1, p.S12013, Sep 11-14, 2011.

10. Professional development activities:

a) Mini-ExCEEd (Excellence in Civil Engineering Education) Teaching Workshop, University of Wisconsin, Platteville, May 2018.
b) Compressed Teaching Courses Workshop, University of Wisconsin, Teaching and Technology Center, Platteville, May 2017.

1. Name: Randy Craig Hurd

2. Education
    a. Ph.D. in Mechanical Engineering from Utah State University: December 2017
    b. M.S. in Mechanical Engineering from Brigham Young University: June 2015
    c. B.S. in Mechanical Engineering from Brigham Young University: August 2012

3. Academic Experience
    a. Assistant Professor at Weber State University - Ogden, UT, 2020 – present

4. Non-Academic Experience
    a. Research Scientist at Naval Undersea Warfare Center (NUWC) Division, Keyport - Keyport, WA, 2017 – 2020

5. Certifications or Professional Organizations
    a. None

6. Current membership in Professional Organizations
    a. Tau Beta Pi (2011 - present)
    b. American Physical Society Division of Fluid Dynamics (2012 - present)
    c. American Society for Engineering Education (2014 – present) (article reviewer)

7. Honors and Awards
    a. Naval Undersea Research Program funding recipient, M.S & Ph.D. (2013)
    b. Van Dyke Award for APS DFD Gallery of Fluid Motion (2014, 2016, 2017)
    c. Best Presentation Award at ASEE Rocky Mountain Section conference (2016)
    d. Co-director of Utah Underwater Robotics, STEM outreach program (2012 - 2015)
    e. Hemingway New Faculty Award, Weber State University (2021)

8. Service Activities
    a. MET Program Co-Coordinator
    b. EAST College Scholarship Committee Member
    c. EAST College Representative on Office of Undergraduate Research Committee
    d. Hiring Committee Member
    e. Weber School District High School Science Fair Judge

9. Most important Publications and Presentations from the Past Five Years

    Papers/Patents:
    a. **Hurd, R. C.,** Allen, J. S., Dick, T., Belden, J., Sur, S., & Truscott, T. T. "Vanuatu Water Music," New Journal of Physics. (***In Preparation)***
    b. **Hurd, R. C.,** Belden, J., Bower, A. F., Holekamp, S., Jandron, M. A. & Truscott, T. T. "Water walking as a new mode of free surface skipping," Scientific Reports 9, article number 6042, 2019.
    c. Speirs, N. B., Mansoor, M. M., **Hurd, R. C.,** Sharker, S.I., Robinson, W.G., Williams, B. J., Truscott, T. T. "Entry of a sphere into a water-surfactant mixture and the effect of a bubble layer," Physical Review Fluids, vol. 3 (10) 2018.
    d. Smith, D. T., Cook, S. L., Gillespie, M. A., Stevens, K. A., Reynolds, H. C., **Hurd, R. C.,** & Wisco, J.J. "High-speed video capture of anterior cruciate ligament tearing in human and porcine ex vivo specimens," Biology, Engineering

and Medicine,
vol. 3 (2) 2018.

e. **Hurd, R. C.,** Speirs, N., Belden, J., Pan, Z., Lovett, B., Robinson, W., Zamora, M., Sharker, S., Mansoor, M., Merritt, A., & Truscott, T. T. "Shear joy of watching paint dry," Physical Review Fluids, 2, 090503, 2017.
f. Pan, Z., Kiyama, A., Tagawa, Y., Daily, J., Thomson, S., **Hurd, R. C.,** Truscott, T. "Cavitation onset caused by acceleration," Proceedings of the National Academy of Sciences, 201702502, 2017.
g. **Hurd, R. C.,** Belden, J., Jandron, M. A., Bower, A. F., Fanning, D. T., & Truscott, T. T., "Water entry of deformable elastic spheres," Journal of Fluid Mechanics, vol. 824, pp. 912-930, 2017.
h. Belden, J., **Hurd, R. C.,** Jandron, M. A., Fanning, D. T., Bower, A. F. & Truscott, T. T., "Elastic spheres can walk on water," Nature Communications, 7, 1055, 2016.
i. **Hurd, R. C.,** Weiss, D. M., Graham, J. J., & Truscott, T. T., "Future time perspective and problem-based learning in a senior thermo-fluids engineering lab", ASEE Rocky Mountain Section Conference, Provo, UT, Sept. 22-23, 2017.
j. Graham, J. J., **Hurd, R. C.** & Truscott, T. T., "Adding a new dimension to a traditional conduction lab", ASEE Rocky Mountain Section Conference, Cedar City, UT, Sept. 30-Oct. 1, 2016. ***(Best presentation award)***
k. **Hurd, R.C.,** Truscott, T. T., Pan, Z. & Merritt, A., "Splash prevention apparatus." U.S. Patent No. 10,612,226. 7 Apr. 2020.
(Presentations)
l. **Hurd, R. C.,** Belden, J., Jandron, M., Bower, A., Holekamp, S., & Truscott, T. T., "Water walking – an evolution of water surface skipping." 70th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Denver, CO. November 19-21, 2017.
m. **Hurd, R. C.,** Belden, J., Pan, Z., Merritt, A. & Truscott, T. T., "Water entry" 69th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, OR. November 20-22, 2016.
n. **Hurd, R. C.,** Belden, J. & Truscott, T. T., "Skipping elastic spheres IV", Naval Undersea Research Program Annual Meeting, Seattle, WA. June 2016.
(Conference Poseters/Videos)
o. Speirs, N., Mansoor, M., Belden, J., Hurd, R., Pan, Z., & Truscott, T. T., "Fluted films." 70th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Denver, CO. November 19-21, 2017. ***(Milton Van Dyke Award)***
p. **Hurd, R. C.,** Speirs, N., Belden, J., Pan, Z., Lovett, B., Robinson, W., Boyer, M., Sharker, S., Mansoor, M., Merritt, A. & Truscott, T. T., "The shear joy of watching paint dry." 69th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, OR. November 20-22, 2016. ***(Milton Van Dyke Award)***
q. Pan, Z., **Hurd, R. C.,** Speirs, N., Pitt, W., Wu, N., Zhang, Y. & Truscott, T. T., "Desert dessert." 69th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, OR. November 20-22, 2016.

1. **Name:** Randall W. Kent, M.S.

2. **Education:**

- Master of Science, Mechanical Engineering, University of Minnesota, Mn, USA, 1985.
- Bachelor of Science, Aerospace Engineering and Mechanics, University of Minnesota, Mn, USA, 1982.
- Bachelor of Science, Mathematics, Utah State University, Ut, USA, 1992.

3. **Academic experience:**

- Weber State University, Ogden, UT, USA, *Lecturer*, August 2016 – present, FT.
- Weber State University, Ogden, UT, USA, *Adjunct Professor*, August 2011 – August 2016.
- Utah State University, Logan, UT, USA, *Adjunct Professor*, August 2012 – December 2017.
- Salt Lake Community College, Taylorsville, UT, USA, *Adjunct Professor*, August 2011 – August 2016.

4. **Non-Academic experience:**

- ATK Corp., Brigham City, Utah, Senior Technical Engineer, Design, Analysis Fabrication and Testing of Solid Rocket Motors, July 1985 – October 2010.

5. **Certifications or professional registrations:**

-

6. **Current membership in professional organizations:**

- American Society of Mechanical Engineers (ASME)
- American Institute for Aeronautics and Astronautics (AIAA)

7. **Honors & awards:**

-

8. **Service activities:**

- ME search committee, Weber State University, 2020.
- MET search committee, Weber State University, 2019.
- Quantitative Literacy Task Force (QLTF) Committee, Weber State University, Oct 2017 – present.

9. **Publications & presentations:**

- Compiled and presented at 7 TIMs (including IDR, SST-1 IDR, and CDR, SST-1 and SST-2 Post-test Data Reviews) and 2 TRRs (SST-1 and SST-2) at ATK Launch Systems as PE on LAS AM and LAS SST motor programs

- Compiled and presented at 3 TIMs (including ECP presentation) at NASA MSFC as PE on CTR Flex Boot Program
- Compiled and presented at 9 TIMs (including PDR, delta PDR, and CDR) and 2 TRRs at NASA MSFC as PE on 24-Inch SRTM-IC and 24-Inch SRTM-IC XL programs
- Presented at over 28 IR decoy flare TIMs as DE on the AIRCMM and Mixed Expendables flare programs.

Authored and presented over 15 industry publications, including most recently:

- Kent, R., Gregory, S., Garbe, D., Maughan, J., Cannon, S., and Smith, C.**, "Launch Abort System Abort Motor Subscale Motor Test Results,"** Presented at the 2009 JANNAF Propulsion Meeting, April 2009.
- Kent, R., Nielson, D., Tanner, R., Larsen, B., Lasoski, S., and Ritchie, R., **"Effectiveness of the TH7S IR Decoy Solution with Transport Aircraft,"** Presented at the 2003 ATEDS Meeting, March 2003.
- Kent, R. and Tanner, R., **"Exhaust Plume IR Measurements for Several Aluminized Propellant Motors,"** presented at the 27th JANNAF Exhaust Plume Technology Meeting, May 2003.
- Kent, R., Larsen, B., Duce, F., A. Haaland, and Ritchie, R., **"Effectiveness of Modified AIRCMM Flare Solution Against SPE,"** Presented at the 2002 Meeting of the IRIS Specialty Group on Infrared Countermeasures, June 2002.

10. Professional development activities:

- Completed AIAA Short Course in Hypersonic Propulsion, December 2018.
- Completed ASME EL 513 Short Course in Intro to CFD, April 2018.
- Completed ASME EL 510 Short Course in Two Phase Flow and Heat Transfer, December 2016.
- Completed ASME EL 507 Short Course in Intro to FEA, April 2016.

1. **Name:** Spencer J. Petersen

2. **Education:**

- Doctor of Philosophy, Mechanical Engineering, University of Utah, 2016
- Master of Science, Mechanical Engineering, University of Utah, 2004
- Bachelor of Science, Mechanical Engineering, University of Utah, 2003

3. **Academic experience:**

- Weber State University, *Assistant Professor*, 2018 – present, PT
- Weber State University, Assistant Professor, 2016 – 2018, FT

4. **Non-Academic experience:**

- Northrop Grumman *Mechanical Engineer*, Minuteman III Ground Subsystem Sustainment 2018 – present, FT
- Orbital ATK *Design Engineer*, Solid rocket motor thermal insulation design 2014 – 2016, FT.
- Northrop Grumman *Analyst*, Trident II missile launcher analysis 2014 (January) – 2014 (March), FT.
- Alliant Techsystems *Design Engineer*, Solid rocket motor thermal insulation design 2003 – 2010, FT.

5. **Certifications or professional registrations: NA**

6. **Current membership in professional organizations: NA**

7. **Honors & awards:**

- Awarded Senior Design Project Award from Orbital ATK, awarded $1500, 2016
- Awarded Dee Family Technology Grant, awarded $1250, 2017
- Awarded Hemingway Collaborative Award, awarded $1906.31, 2017

8. **Service activities:**

- EAST Diversity Committee 2016 – 2018
- EAST Scholarship Group 2017 – 2018
- WSU ASME Chapter faculty representative 2017 – 2018
- New faculty hiring committee 2018
- ME program development committee 2017 – 2018
- Utah Science Olympiad judge and event coordinator 2017
- Outdoor Weber competition mentor 2018
- Mentor for three students pursuing undergraduate research 2016 – present

9. Publications & presentations:

- "*Near-field Thermal Emission Due to Surface Plasmon Polariton Resonance from Indium Tin Oxide in the Near Infrared*", 3rd International Workshop on Nano-Micro Thermal Radiation, paper and conference presentation, 2017
  ASEE paper and conference presentation, 2013

10. Professional development activities:

- Guest lecture regarding current research activities to the WSU 1560 class (OUR scholarship students) 2017
- "*Metamaterial for Thermal Energy Harvesting*", Tech Talk presented to WSU IEEE meeting 2017
- "*Engineering Materials in Thermal Sciences*", Talk presented to University Research Club Opening Social 2016

Kelly Harward
Weber State University
Manufacturing Engineering Technology

Education:

- M.S. Manufacturing Engineering Technology, Emphasis: Computer-Integrated Manufacturing, Brigham Young University, 1991
- B.S. Design Engineering Technology, Brigham Young University, 1976

Academic experience:

- Weber State University, *Professor,* Ogden, UT 2012-present
- Weber State University, *Associate Professor*, Ogden, UT 1995-2012
- Weber State University, *Assistant Professor*, Ogden, UT 1987-1995

Non-Academic experience:

- Consultant, design engineer for product, manufacturing tooling, and production equipment for Unisys, Chromolox, Thiokol, Iomega, Autoliv, Back-To-Basics(Focus Electrics), Venture Outdoors, Zagg Inc., Mills Equipment, Utah Science Technology and Research Initiative, and Utah Center for Aeronautical Innovation & Design; Part-time, sabbatical, and consulting, 1987-Present.

- Account Manager, SLC, Ut., June 1983-July 1987. Managed application engineers in coordinating customer support, writing proposals and preparing benchmarks in computer-aided engineering applications. Managed customer accounts and worked with engineering managers to ensure success of systems.

- Sr. Applications Engineer, SLC, Ut., June 1981-June 1983; Chicago, Ill., Dec 1976- July 1979. Provided support in mechanical engineering and manufacturing applications of CAD/CAM Systems. Conducted customer training and software development in a wide variety of applications. Provided technical support in the implementation and use of CAD/CAM applications such as design using solid modeling techniques, analysis using finite element methods, automated drafting, and NC programming. Conducted application studies, assisted in CAD/CAM implementation plans and developed custom software programs for demonstrations and benchmarks.

- Consultant, SLC, Ut., 1979-81. Completed several consulting projects for Applicon to provide applications engineering support. Also provided other CAD/CAM system suppliers and users with application studies, benchmark tests, system evaluations, demonstrations, recommendations and training seminars in mechanical design, and manufacturing engineering applications of CAD/CAM systems.

Certifications or professional registration:

- SME

Honors & Awards:

- Patent US: 8,915,484 Awarded Dec. 23, 2014: Fluid Delivery Valve & Compression Member
- Patent US 7,587,986 Awarded Sept. 15, 2009: Modular Personal Pontoon Boat.
- Patent D549043 Awarded August 21, 2007: Slushie maker
- Other Patent Pending Applications

Service Activities:

- Program Coordinator, Manufacturing Engineering Technology Program WSU;
- Committee Member, Undergraduate Research Committee WSU;
- Chairman, Manufacturing Engineering Technology Advisory Board WSU.
- Coordinated activity with suppliers, purchased a new RP machine for WSU.

Publications & Presentations:

- Harwaka Tutorials, YouTube: https://www.youtube.com/channel/ UCOgleJ0tJLvak1UofG—oPA
- Models & Tutorials, GrabCAD: https://grabcad.com/kelly.harward-3/models
- Prepared Paper for publication: *Vector, Scalar, & CAD Formulation Methods for Moments.*
- Presentation, APICS - The Educational Society for Resource Management, Salt Lake Chapter, March 23, 2000.
- "An Online Course Development Procedure", in the Conference Proceedings of the SME 1998 International Conference on Education In Manufacturing, October 16, 1998.

Professional development:

- Developed a computer-aided design procedure to validate manual calculations of Area Moment of Inertia about specified axes;
- Developed a CAD procedure to demonstrate the relationship between the cross-product to calculate moments in 3D vs. the product of force and distance in 2D.
- Learned procedures to publish research, tutorials, and CAD models on YouTube and in GrabCAD.
- Parametric Technology CreoI Course, Santa Clara, CA. July 2011.
- Research, Instructional Improvement, and Hemingway Foundation Grant for the development of two courses: Parametric Modeling (DET 3460) and Plastic Product Design (Mfet 2870).
- PLTW Summer Training Institute, Engineering Design & Development, Rochester Institute of Technology, 2007.
- Investigated current trends in CAD/CAM systems among local manufacturing companies. Gained industry experience using SolidWorks and Pro/E as a contract design engineer with local manufacturing firms during the summer months. Acquired SolidsWorks and Pro/E (Creo) for the Mfet 3460 and DET 3460, developed new curriculum for the course.

Kerry Tobin
Weber State University
Manufacturing Engineering Technology

Education:

• M.S. - Computer Integrated Manufacturing	Brigham Young University	1985
• B.S. - Manuf. Eng. Tech.	Weber State College	1975
• Certificate of Completion - Machine Tool	Weber State College	1971

Academic Experience:

- Weber State University, Professor, Ogden, UT, 2015- present
- Weber State University, *Associate Professor*, Ogden, UT 1994-2015
- Weber State University, *Assistant Professor*, Ogden, UT 1981-1994
- Weber State University, Faculty Cross-training courses to department faculty on shop equipment use during the 2014/2015 year.
- *Developed and taught* coordinate measuring machine theory and hands-on operation at GSC Casting and Peterson Specialized Fabricators, Ogden, Utah (part time) 1987-88.

Non-Academic experience:

- *Consultant Engineer* - Tool design, roll forming machine design and equipment specifications, plant layout, safety procedures & equipment design, Chromalox - Electric Heater Division, Ogden Utah, (full time summers & part time during school year), 1992 to 2007, Plus two Sabbatical leaves, one during academic year 1994-95 and another Fall Semester 2001.
- *Contract Engineer* - Research and process development on flexible sensors for the passenger-side air bag deployment on the year 2000 Cadillac automobile, Flexpoint - Flexible Sensor Systems, Midvale, Utah, (summer), 1999.
- *Tool Designer* - Designing of metal stamping and forming tooling for production items. Lifetime Products - Freeport Center, Clearfield, Utah, (full-time summer and part-time during the school year), 1990-1991.
- *Facilities Engineering Technician*, Hill Air Force Base - Utah, (full-time summer and part-time during the school year) 1986-90.
- *Composites Products Engineer* Morton Thiokol- Brigham City, Utah, (summer) 1985
- *Manufacturing Engineering Technologist*, Logan Manufacturing (formerly Thiokol Corp), Logan, Utah, 1976-1981. Products: Ski lifts and snow grooming vehicles.
- *Industrial Engineering Technologist and Production Line Supervisor*, National Semi-Conductor - West Jordan, Utah, 1975-76. Products: Hand-held calculators and printed circuit boards.

Certifications or professional registration:

- Society of Manufacturing Engineers Chapter 085 - Member 1981 to present.
- Metal Fabrication - Member 1982 to present.
- American Foundry Society - Member 1982 to present.

Honors & Awards:

- Received Exemplary Collaboration Award for Faculty in Manuf./Mech. Eng. Tech. Department, 2004
- Received Exemplary Collaboration Award for Faculty in Manuf./Mech. Eng. Tech. Department for the Hybrid Electric Vehicle Project Team, 1996
- Received Exemplary Collaboration Award for Faculty in Manuf./Mech. Eng. Tech. Department 1992 .
- Received funding for RS&PG workshop to teach Coordinate Measure Machine (CMM) usage to MFET/MET department faculty, 1993 & 2000.

Publications & presentations:

- Co-authored paper with George Comber titled "Cradle to Cradle Sustainability Concept for Technology Education Senior Capstone Projects". Presented at the American Society of Engineering Education (ASEE) conference for Industry and Education Collaboration (CIEC) in February 2015

Service Activities:

- Currently serve as a board member on the Faculty/ Staff planning committee 2014-2015.
- Advisor to Student Chapter S061 of the Society of Manufacturing Engineers at WSU, 1986 - present.
- Manufacturing Engineering Technology Program Coordinator 2008.
- Served on Ranking & Tenure Evaluation Committees at WSU, 2003 & 2008 to present.
- Served as chair of Department Peer Evaluation Committees at WSU, 2008.
- Took the Senior Project students to WESTEC Manufacturing Challenge contest during Spring break in March of 2008 & 1998, Los Angeles, Calif. They won second place for their automatic weight spotter in 1998, used for power lifting by home and Health Spa enthusiasts (Patent Pending). The prize was Virtual Gibbs software for department.

Professional development:

- Attended Hobart Institute of Welding filler metals training facility in Troy Ohio, May 28-31, 2013. Evaluated various filler metals and applications through classwork and lab experiments.
- Attended Miller Welding training sessions on new products and processes held at WSU.
- Attended WESTEC Tool Show, Los Angeles, Calif., March 29 - April 1, 2008.
- Attended International Conference on Permanent Mold Casting of Aluminum and Magnesium, Dallas, Texas, February 10 - 12, 2008.
- Attended American Foundry Society Northwest Conference, March 1-5, 2006.

1. Name - Mary Foss

2. Education
    a. Master of Science, Mechanical Engineering: Pharmaceutical Manufacturing, Stevens Institute of Technology, 2012.
    b. Bachelor of Science in Engineering, BioMedical Engineering, Arizona State University, 2005.

3. Academic experience
    a. Weber State University, Assistant Professor, MET Program Coordinator, 2016 – present, full-time.
    b. Weber State University, Director of Concept Center, 2017 – present, part-time.
    c. Weber State University, Adjunct instructor, 2015-2016, part-time.

4. Non-academic experience –
    a. Fresenius Medical Care, Technical Services Engineering Manager, Responsible for Metrology Department, validation committee chair, 2013 – 2014, full-time.
    b. Fresenius Medical Care, Utilities Engineering Manager, Responsible for management of utilities engineering department, validation, expansion projects and quality specialist for pharmaceutical water, steam, and cleanrooms, 2009-2013, full-time.
    c. Fresenius Medical Care, Utilities Project Engineer, responsible for utilities expansion projects, quality system of utilities, 2007 – 2009, full-time.
    d. ATK Launch Systems, Propellant Design Engineer, raw material specialist for two rocket propellant ingredients, responsible for humidity study and propellant aging study, 2005 – 2007, full-time.

5. Certifications or professional registrations
    a. ISO 13485 Lead Auditor Certified December 2009
    b. US DOE Qualified Steam Specialist Sept 2010
    c. SME Certified Green Specialist June 2012
    d. Environmental Compliance April 2011
    e. Advanced Management of Compressed Air February 2009

6. Current membership in professional organizations
    a. Society for the Advancement of Materials and Process Engineering

7. Honors and awards
    a. Arizona State Provost Scholarship
    b. Yavapai-Apache Nation Ambassador Scholarship
    c. CSEMS (Computer Science and Engineering Mathematics Scholar)

d. Most Valuable Student Scholarship
e. Leadership Northern Utah Graduate

8. Service activities (within and outside of the institution)
   a. Faculty advisor for Society of Women Engineers (SWE)
   b. Initiated and advisor for new student chapter for Society for the Advancement of Materials and Process Engineering (SAMPE)
   c. Department representative for Diversity and Inclusion Committee
   d. Department representative for Outreach Committee
   e. College representative for Environmental Issues Committee.
   f. Organized and Presented at Parent Daughter Engineering Night
   g. Instructor for Summer Girls Welding Camp
   h. Volunteer for SHETech, Majorfest, Evening with Industry, Take our Sons and Daughters to Work.

9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
   a. Foss, M., & Deceuster, A. (2017). A History of Quality and The Evolution of the Modern Day Leader. *Pharmaceutical Engineering, Volume 37* (1). Pp. 48
   b. Foss, M., & Peterson, S. (2017). Tips for Transitioning to Industry. *Pharmaceutical Engineering, Volume 37* (4). Pp. 28
   c. Foss, M. (2017). Returning to Work After a Career Break. *All Together, Society of Women Engineers*. http://alltogether.swe.org/2017/09/returning-work-after-career-break/
   d. Foss, M. (2018). The Engineering Comfort Zone. *All Together*, *Society of Women Engineers*. http://alltogether.swe.org/2018/01/the-engineering-comfort-zone/
   e. Foss, M. *From Rockets to Weber State University*, Society of Women Engineers, Weber State University, Spring 2017.
   f. Foss, M. *Choose Your Own Adventure*. Women in STEM Lightning Talks, Weber State University, September 8, 2017.
   g. Foss, M. *Engineering Disciplines*. Parent Daughter Engineering Night, Weber State University. November 2017.

Briefly list the most recent professional development activities

- Submitted accepted paper for UVU Engineering and Technology Conference on Project-Based Learning, served as conference reviewer. Conference rescheduled due to Covid-19.
- ME Search Committee member
- Submitted accepted proposal for interactive workshop for Utah Women in Higher Education Conference. Conference rescheduled due to Covid-19.
- Attended SAMPE Long Beach Conference, Wasatch Materials Expo, Intermountain Sustainability Summit, United Nations Civil Society Conference.

Megumi Usui

Education:

Master of Science: Computer Graphics Technology Purdue University: College of Technology401 N. Grant Street, West Lafayette, IN 47907-2021Graduated: May 2005

Bachelor of Science: Computer Design Graphics Technology Weber State University1802 University Circle, Ogden, UT 84408Graduated: May 2003degree, discipline, institution, year

Academic experience:

Weber State University: Assistant Professor 2009 – 2015 Associate Professor 2015 – present Program Coordinator 2017 – present

Purdue University: Teaching Assistant 2005

Non-academic experience:

OP Tanks: Consultant, designing for a welding product April 2021

Daimler Trucks North America (Freightliner): June 2006 – July 2009 Mechanical Engineer II under Cab department, full-time.

M-TEK, Inc.: August 2005 – June 2006 (Upper Sandusky, Ohio) Design Engineer under Production, Design and Quality department, full time.

Subaru of Indiana Automotive, Inc: May 2004 – August 2004 (Lafayette, Indiana) Internship: Catia V4 Trainer, part-time.

Certifications or professional registrations:

Introduction to eLearning course

Honors and awards:

Student of the Year, Weber State University 2003

Service activities

Being the PDD program coordinator.
A member of Diversity Committee.
Being the Departmental Honor program representative.
Work with the Hall Global Entrepreneurship Center for collaboration.
PDD self-study report for ABET

Helping elementary students with reading at Da Vinci Elementary in

Ogden Professional development activities

Attending a Webinar: Meet the Experts Session: Building World Class Products Accurately and Efficiently Using the Latest Manufacturing Techniques, May 26 Self-teaching of new techniques of SolidWorks and Catia V5.
Attending Diversity Conference October 2019
Attending Basic Teamcenter Training September
2019
Attending Diversity and Justice in STEM Education October 2018
Presenting the program at N. Utah STEM Expo November 2018
Mentor at SheTech March 2017
Participate in WSU Olympic TV Commercials August 2016
Giving a GD&T training at Fresenius in August 2016
Administrator for IEEE SUSTECH Conference 2015

APPENDIX C – EQUIPMENT

The College of Engineering, Applied Science & Technology (EAST) has lab and shop equipment to support both Engineering Technology programs and Engineering programs at WSU. Students and faculty from these programs share the equipment in the labs listed in this section.

1. Thermal-Fluids Equipment ET Rm 234

- Hydraulics bench
- Bernoulli apparatus
- Fluid friction apparatus
- Osborne Reynolds apparatus
- Hydrostatic forces apparatus
- Impinging jet force apparatus
- Airflow chamber
- Thermoelectric heat pump
- Heat exchanger demonstrator
- Vacuum oven
- Thermal contact resistance apparatus
- Single pin fin apparatus
- Pin fin bank apparatus
- Forced air cooling of simulated electronic devices apparatus
- Natural convection cooling of simulated electronic devices apparatus
- Compact cold plate apparatus
- 2-D steady conduction apparatus
- Surface-to-surface radiation apparatus
- Blackbody calibration apparatus
- Lumped heat capacity system apparatus
- Heat pipe testing apparatus (will be built under RSPG grant by Dec. 2020)
- Refrigeration cycle apparatus (ARCC pending)
- Visualization of streamlines (ARCC pending)
- Energy losses in piping systems apparatus (ARCC pending)
- 24-channel digital thermometer
- Turbine flow meter
- Hand-held infrared thermometer
- Various thermocouples, liquid-in-glass thermometers, and pressure gauges

2. Machining & Fabrication Equipment ET Rm 201

- 10 Manual Lathes, Nardini,
- 10 Manual Mills, Bridgeport, M02
- Lathe, HAAS
- Mill, Mazak CNC
- Mill, HAAS CNC
- 2 Mills, HAAS TM1P CNC
- Bandsaw, S2, Vertical
- Bandsaw, S3, Horizontal, Auto
- Bandsaw, S1, Vertical, Large
- 3 Belt Sanders
- 4 Lathes, HAAS TL -1 Lathes (CNC/Manual)
- Drill Press, DP1
- Surface Grinder, 6", Manual, White
- Surface Grinder, 6", Auto, Green
- 55,000 psi Flow Industries Waterjet
- Mitutoyo Microscope
- Coordinate Measuring Machine
- Starrett Optical Comparator
- Brown & Sharp HITE-ICATOR
- Inspection and measurement tools
- 3 rapid prototyping machines

3. Metallurgy Equipment ET Rm 217

- Acu Scope Microscope with computer and camera
- Bakalite Specimen Press Good
- 1 Rockwell Hardness Tester
- 1, 3 Station Lap Polisher Grinder, G5
- 1 Metal Cutoff Saw
- Auto polisher
- Micro Hardness tester

4. Welding Equipment ET Rm 219, 225, 231

- 14 Syncrowave 250DX Miller Welders
- Miller Panasonic welding robot
- 8 Delta Weld 302 TIGWelders
- 1 Access 450
- 1 Syncrowave 350
- 1 Dimension 450

- 1 Syncrowave 350 (dup)
- 1 Miller. Summit Submerged Arc
- 1 XMT 350 cc/cv
- 1 XlY Plasma Arc Table
- 1 XMT350Mpa 1 Portable Cuttingtorch
- 2 Invision 350 Mpa
- 1 Plasma Arc Cutter
- 1 Dynasty 350
- 4 Spectrum 1000 Plasma Arc Cutter
- 1 Dynasty200
- 1 Millermatic 350p
- 1 Spectrum 375 xtreme
- 1 Millermatic 252
- 1 Victor 2 station cutting torch track
- 1 Millermatic 210
- 1 Millermatic 140
- 1 Millermatic DVI2
- 1 Aerowave 300

Note - Miller Electric partners with WSU and supplies a significant amount of equipment for use that is rotated out and replaced with new equipment on an ongoing basis.

5. Plastics & Composite Equipment ET Rm 239

- Rotational Molding Oven
- Grinder 1 Roll Mold Machine
- 2 Morgan Injection Presses
- 1 Thermal Form Machine
- Van Doren 120 Injection Molding Machine
- Molding Machine
- Laser-Epilog
- 2 Plastic Welding Benches
- 1 Formech Vacuum Form Machine
- 2 Ovens, composites
- 2 Vacuum chambers
- 2 Paint/Ventilation booths

6. Stress Analysis Equipment ET Rm 243, 201

- 1 MTS 55kip Hydraulic Tensile Tester
- 1 Strain Gage Tech. equipment
- 1 Manual Torsion Test machine
- 1 Teaching Polariscope
- 1 Charpy Impact Tester

- 1 Dillon Tensile Test Machine
- 1 V notch press for sample preparation for impact testing
- Instron 22 kip servo-hydraulic fatigue/tensile tester with fracture mechanics software

7. Instrumentation & Control Systems Equipment ET Rm 120

- 2 Quanser AEROs
- Micro-Controllers (Arduino Mega 2560, Arduino UNO, Raspberry PI)
- Ultrasonic Sensor HC-SR04
- Breadboard, LED, Resistors, Wires, etc.
- DHT11 Temperature and Humidity module
- LCD1602 module
- Potentiometers
- 30:1 Gear-motors
- 64 CPR Encoder
- L298N H-Bridge
- Water Level Sensor
- NTC Thermistors
- Flexor - Cantilever flexure frame setup
- Strain Gauges
- NI 9219 DAQ (Universal Analog Input Module) Devices
- Soldering Stations (40-Watt)
- Pressure transducer calibration kit
- Digital Multimeters

APPENDIX D – INSTITUTIONAL SUMMARY

1. The Institution

a. Name and address of the institution.

Weber State University

3750 Harrison Blvd.

Ogden, Utah 84408

b. Name and title of the chief executive officer of the institution.

Brad Mortensen, President

Weber State University

Mail Code 1001

Ogden, Utah 84408-1001

c. Name and title of the person submitting the Self-Study Report.

David Ferro, Dean

College of Engineering, Applied Science & Technology

Weber State University

Mail Code 1801

Ogden, Utah 84408-1801

d. Name the organizations by which the institution is now accredited, and the dates of the initial and most recent accreditation evaluations.

Northwest Commission on Colleges and Universities (NCCU)

Date of initial accreditation: 1932

Date of last accreditation: 2015

2. Type of Control

Weber State University is controlled by the State of Utah through the Utah State Board of Regents, the higher education arm of the Utah Legislature.

3. Educational Unit

The Mechanical Engineering Technology Program is housed within the Department of Mechanical Engineering, which offers three academic degrees:

1. BS in Mechanical Engineering
2. BS in Mechanical Engineering Technology
3. Associates of Pre-Engineering

The Department of Mechanical Engineering is one of six academic departments in the College of Engineering, Applied Science & Technology (EAST). The dean of the College reports to the Provost, who reports to the President of WSU. Figure D-1 is the organizational chart of the local educational unit. Figure D-2 is the organizational chart of Weber State University.

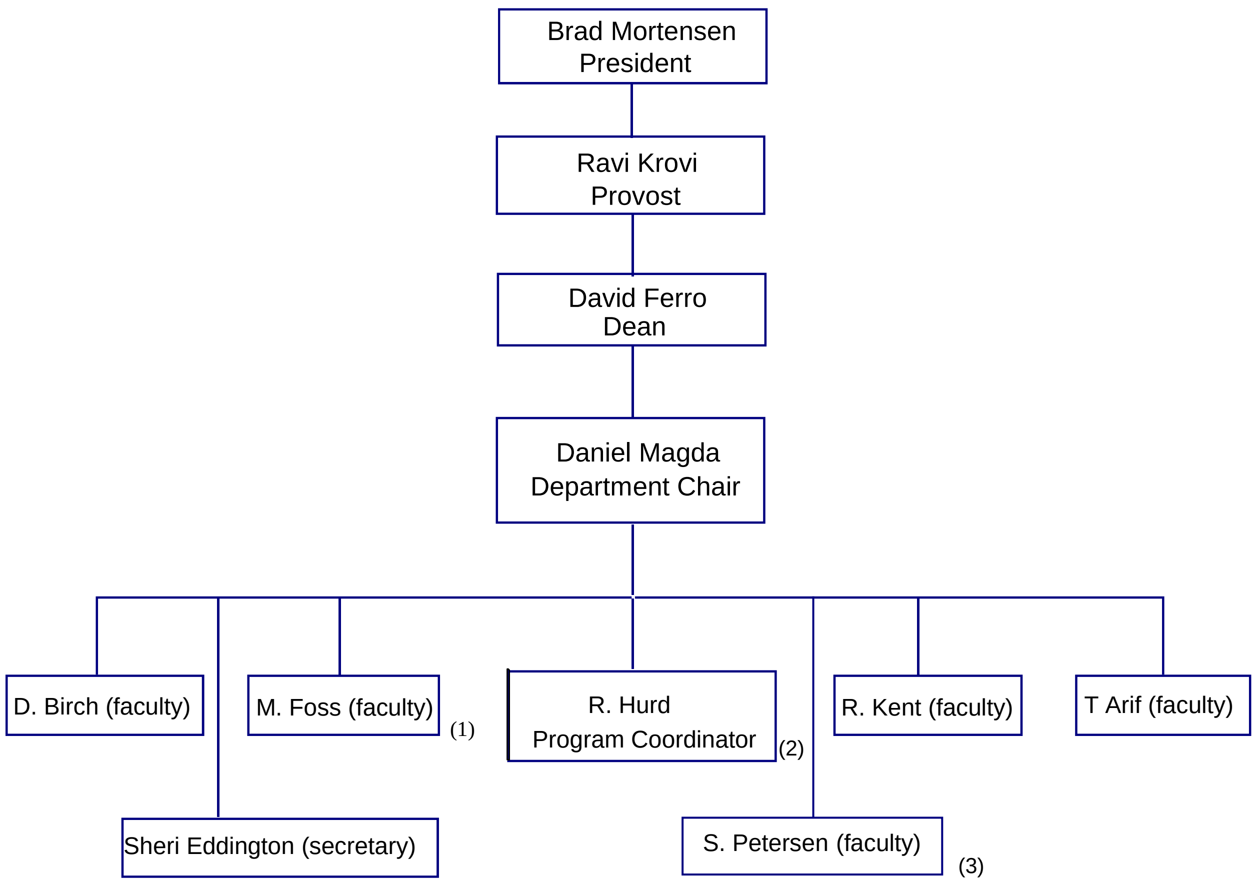


Figure D-1. Local educational unit organizational chart.
1. M. Foss position change to the Manufacturing System Engineering department July 2020.
2. R. Hurd new Mechanical Engineering faculty started July 2020.
3. S. Petersen part-time faculty.

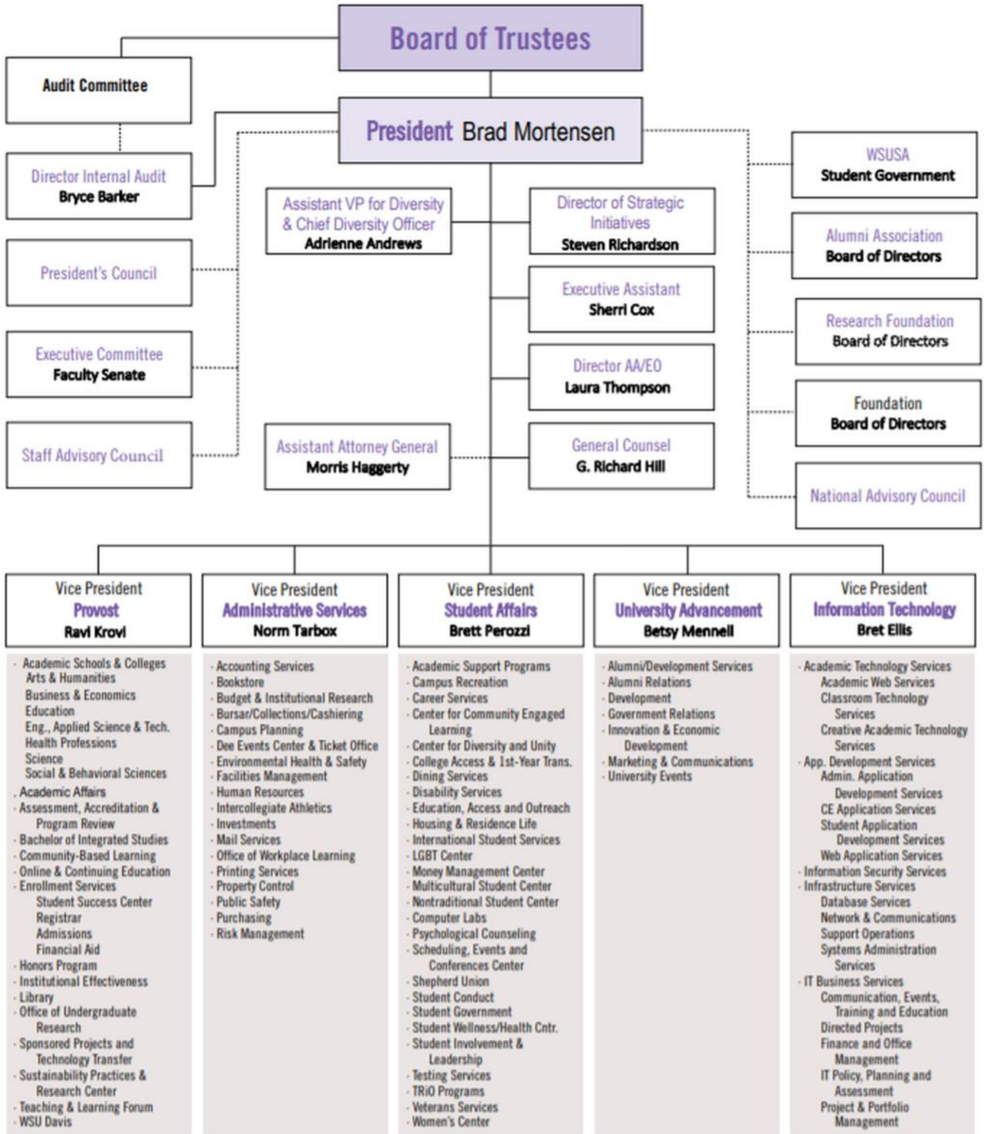


Figure D-2. WSU Division of Academic Affairs organizational chart.

4. Academic Support Units

Names and titles of individuals responsible for each of the units that teach courses required by the program.

Daniel Magda, Professor, Chair, Department of Mechanical Engineering
Sandra Fital-Akelbek, Professor, Chair, Department of Mathematics
Colin Inglefield, Professor, Chair, Department of Physics
Laine Berghout, Professor, Chair, Department of Chemistry
Kyle Feuz, Assistant Professor, Chair, School of Computing
Justin Jackson, Professor, Chair, Department of Electrical & Computer Engineering

5. Non-academic Support Units

Names and titles of individuals responsible for each of the units that provide non-academic support to the program.

<u>Inside EAST:</u>

Sheri Eddington	Department of Mech. Engr. Administrative Assistant
Gina Naisbitt	Executive Assistant to the Dean
Kimberly Ealy	Career Advisor
Rainie Ingram	Graduate Enrollment Director
Dana Dellinger	Director, Center for Technology Outreach
Brad Naisbitt	IT Manager
Kelly Stackaruk	Development Director
Allyson Saunders	Associate Dean
Brian Rague	Associate Dean
Julie Christensen	Academic Advisor
Angie Payan	Academic Advisor
Aimee Golden	Academic Advisor
A. J. Singta	Network Technician
Cordell Gold	Lab Technician

<u>Outside EAST</u>

Wendy Holliday	Dean of the Library
Jeffrey Hurst	Dean of Students
Jed Spencer	Director, Financial Aid & Scholarships
Casey Bullock	University Registrar

6. Credit Unit

Weber State University is on the semester system. One credit hour represents one class hour or three laboratory hours per week. Each semester consists of approximately 14 weeks of instruction plus three or four additional days for final examinations. The fall, spring, and summer semesters are of equal duration.

7. Tables

Table D-1 contains program enrollment and degree data, and Table D-2 contains personnel data.

Table D-1. Program Enrollment and Degree Data

Mechanical Engineering Technology

Academic Year		Enrollment Year					Total Undergrad	Total Grad	Degrees Awarded			
		1st	2nd	3rd	4th	5th			Associates	Bachelors	Masters	Doctorates
2020-2021	FT	3	11	16	15	N/A	145	N/A	6	12	0	0
	PT	42	18	23	17	N/A		N/A				
2019-2020	FT	3	9	18	15	N/A	162	N/A	8	19	0	0
	PT	41	24	29	23	N/A		N/A				
2018-2019	FT	4	10	16	23	N/A	182	N/A	11	21	0	0
	PT	40	34	29	26	N/A		N/A				
2017-2018	FT	11	5	8	28	N/A	186	N/A	20	29	0	0
	PT	47	30	13	44	N/A		N/A				
2016-2017	FT	11	11	12	39	N/A	226	N/A	13	31	0	0
	PT	45	30	20	58	N/A		N/A				
	PT	60	35	19	68	N/A		N/A				

Note – The total 1st, 2nd, 3rd, 4th-year enrollment corresponds to freshman, sophomore, junior, and senior & undergrad unclassified as reported by WSU institutional analysts in the Budget office.
FT--full time
PT--part time

Table D-2. Personnel

Mechanical Engineering Technology

Semester/Year[1]: _____Spring/2021____

	Head Count		FTE[2]
	Full Time	Part-Time	
Administrative[2]	0.5	0	0.5
Faculty (tenure-track)[3]	6	0	6
Other Faculty (excluding student assistants)	1	1	2
Student Teaching Assistants	0	0	0
Student Research Assistants	0	0	0
Technicians/Specialists	0.1	0	0.1
Office/Clerical Employees	0.5	0	0.5
Guidance Counselor	0.5	0	0.5

Note – This chart summarizes loads for MET tenure track and non-tenure-track faculties, administrative specialists, and technicians.

1. Data on this table is for the spring term (2021) immediately preceding the visit. Updated tables for the fall term (2021) will be prepared for the team when they visit.
2. Headcount was determined by the planned allocation to each category. Persons holding joint administrative/faculty positions or other combined assignments were allocated to headcount according to the fraction of the appointment assigned to that category. FTE was determined by the actual hours assigned in Spring 2020 divided by the expected load. FTE is larger than headcount because faculty were teaching overload, primarily due to Covid schedule issues.
3. For faculty members, 1 FTE equals 12 hours for tenure track faculty and 15 hours per semester for instructors.

APPENDIX E – MEETING MINUTES

MET Program Minutes from Recent Program-Related Meetings

<u>Meeting – 9 Dec. 2020</u>

Attendees: Tariq Arif, Dustin Birch, Randy Hurd

Topics Discussed:

1. Methodology for continuous improvement
    a. **Decided** to revise assessment approach to mirror that used in Mechanical Engineering – program will be assessed using the following
        i. MET Assessment Exam
        ii. Senior Exit Survey
        iii. Senior Project Rubrics
        iv. Course Rubric Performance Indicators (PI)
            1. Performance Indicators are assessed from average student scores on exam questions designed for each PI, not instructor opinion.
    b. **Decided** that MET Program Coordinator will evaluate assessments materials annually and submit a written Evaluation Report to MET Department
2. Program Educational Objectives (PEOs)
    a. **Decided** to revise existing program educational objectives to align more closely with current ABET guidelines
        i. Discussed the possibility of creating a survey for the next Industrial Advisory Board meeting to assess PEOs
            1. Any PEO revisions must be updated on program website
3. Senior MET Assessment Exam
    a. **Decided** that current MET Assessment Exam is sufficient for evaluating student outcomes, but we will discuss ideas for future improvement in upcoming Department Meetings

Meeting – 14 Jan. 2021

Attendees: Tariq Arif, Dustin Birch, Randy Hurd, Daniel Magda

Topics Discussed:

1. Methodology for continuous improvement
    a. **Decided** to use the Continuous Improvement Report for Provost office as a vehicle for our annual Evaluation Report for continuous improvement for ABET.
2. Program Educational Objectives (PEOs)
    a. **Decided** to revise existing program educational objectives to align more closely with current ABET guidelines and student objectives
        i. Randy will take the lead on this

Annual Assessment Meeting – 5 May 2021

Attendees: Daniel Magda, Kirk Hagen, Dustin Birch, Tariq Arif, Randall Kent, and Randy Hurd

Topics Discussed:

1. Program Assessment Changes
    a. Previous program assessments had evaluated 11 student outcomes in line with previous recommendations from ABET. In order to align with current ABET recommendations, the department faculty decided to change our evaluation procedure to focus on 5 student outcomes. The majority of performance indicators were kept, just assigned to the best-fitting of the new student outcomes.
2. Annual Program Assessment
    a. Annual program assessment was briefly reviewed by the program coordinators. The assessment of all student outcomes was satisfactory, except for Student Outcome (SO) 4.
        i. One of the PIs for SO4 was not met, but this is considered a minor shortcoming by our assessment process. The program coordinator and instructor will develop a plan of action.
3. Students met the target for the senior exit exam
    a. Students did not seem to have a particular subject weakness

    b. No action taken in response to assessment exam
4. It was mentioned by multiple faculty members that students have expressed a desire to have more options for technical electives
    a. **Decided** to add more approved technical electives.
    b. Created a preliminary list of potential additions
        i. Randy to finalize list and submit to curriculum committee in fall.
5. Faculty discussed that MET 4650 Thermal Science is very fast-paced and students would appreciate additional time to learn the topics.
    a. Decided to divide course into two courses.
        i. Dustin (current instructor) will work out the details.
        ii. Randy to submit change to curriculum committee in fall.

<u>Industrial Advisory Committee Meeting – 3 June 2021</u>

Attendees: Daniel Magda, Kirk Hagen, Dustin Birch, and Randy Hurd

Topics Discussed:

1. Updated Committee on approaching ABET visit.
2. Presented new Program Educational Objectives (PEOs).
    a. Committee formally approved of new PEOs.
        i. No objections were vocalized.
3. Reviewed current approach for assessment of student outcomes.
    a. Asked committee for feedback.
        i. No feedback was provided.
4. Presented new technical elective courses to be added to MET degree.
    a. Committee was supportive of the suggested changes.
        i. No objections were vocalized.
5. Asked Advisory Committee if they had feedback for the MET program.
    a. No feedback was given.
6. Collected anonymous survey results.

AGENDA

Weber State University Mechanical Engineering Department Industry Advisory Committee Meeting
Summer, 2021

Welcome – Dan Magda (Department Chair)

Introductions of Board Members, Faculty & Staff (ask to record)

Mechanical Engineering Technology (MET) Program

MET ABET summary & update Virtual visit –
Nov 7, 2021 Final notification - July 2022

MET Program Educational Objectives (PEO's)

The Program Educational Objectives of the Mechanical Engineering Technology program are:

1. Graduates will continue their professional development through involvement in professional organizations, formal educational opportunities, employer-based training programs, and other activities that enhance their technical and managerial abilities.
2. Graduates will be prepared to assume increasing levels of technical or managerial responsibility and to act as peer mentors in the area of Mechanical Engineering Technology or related fields.
3. Graduates will work to enhance their creativity and innovation in their approach to engineering design, solving problems, conducting experiments and other critical aspects of their discipline.
4. Graduates will continue to improve in their ability to communicate effectively to diverse audiences through written, oral and graphical means.
5. Graduates will exhibit a commitment to quality and ethics in their professional and personal lives.

The Program Educational Objectives are publicly available on the Mechanical Engineering website:

ABET MET Assessment Tools for the Program Assessment of Student

Outcomes
Student outcomes are assessed primarily through six measures

1. Student exit surveys
2. Industry advisory board meetings
3. Student evaluations of classes
4. Faculty ongoing improvement through our Closed Loop Action process
5. Evaluation of the Capstone Projects & student work in each class
6. Mechanical Engineering Technology Assessment exam.

Motion to Approve MET's PEO's

Curriculum Review – Technical Electives
Program Credit Hours 123
Students can take COOP for 1 lower division technical elective
MET students can take technical electives from: MSE, PDD, ME, Welding, Math, Physics, Chemistry

APPENDIX F – ASSESSMENT

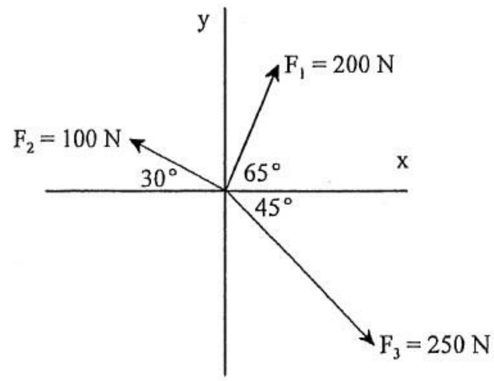
This appendix contains the following tools, which are used by the program for the assessment of student outcomes.

1. Senior Assessment Exam
2. MET 3150 Engineering Technology Materials, Course Evaluation (C.E.) Rubric
3. MET 3400 Machine Design, Course Evaluation Rubric
4. MET 3500 Mechanical Measurement & Instrumentation, Course Evaluation Rubric
5. MET 3700 Testing & Failure Analysis, Course Evaluation Rubric

MET 4990 Exit Exam - TEMPLATE

1.

Three concurrent forces act as shown. What is the magnitude of the resultant force?



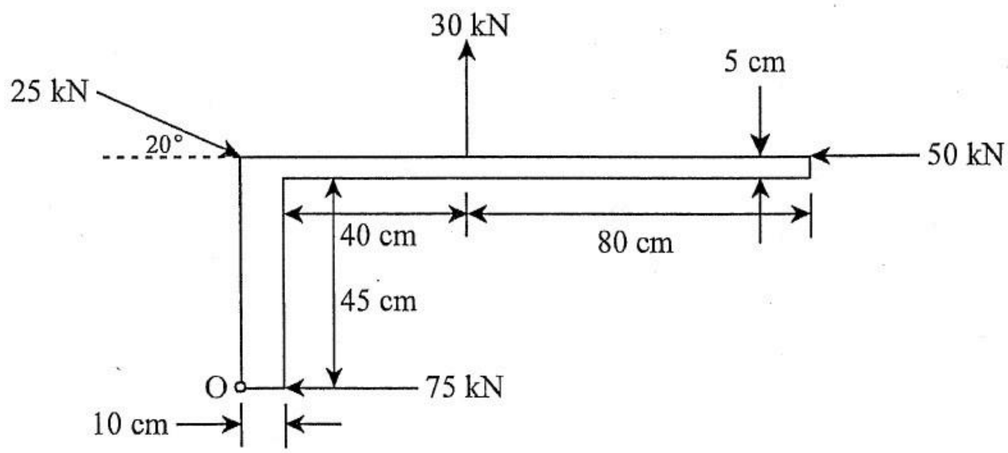
(A) 78 N
(B) 183 N
(C) 246 N
(D) 147 N

Click in the box below and type in your response

B

2.

A system of forces acts on a bracket as shown. Find the moment about point O.



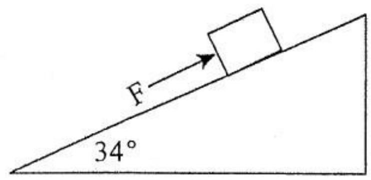
(A) 18.6 kN·m, clockwise
(B) 32.2 kN·m, clockwise
(C) 14.9 kN·m, counter clockwise
(D) 28.3 kN·m, counter clockwise

Click in the box below and type in your response

✔D

3.

A 2-kg block rests on a 34° inclined plane. If the coefficient of static friction is 0.2, what is the minimum force F required to keep the block from slipping down the plane?



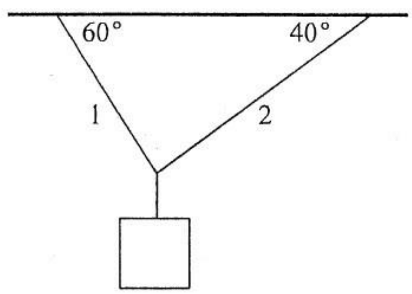
(A) 7.7 N
(B) 8.8 N
(C) 9.1 N
(D) 14 N

Click in the box below and type in your response

✔A

4.

A 200-kg crate hangs from two cords as shown. The tensions in cord 1 and 2, respectively, are:



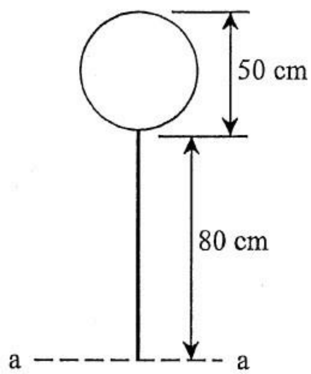
(A) 1526 N, 1752 N
(B) 1790 N, 1526 N
(C) 1526 N, 996 N
(D) 996 N, 1526 N

Click in the box below and type in your response

✔C

5.

For the composite body consisting of a slender rod and a thin circular plate, find the mass moment of inertia about the a-a axis. The masses of the rod and plate are 1 kg and 5 kg, respectively.



(A) 5.80 $kg \cdot m^2$
(B) 0.21 $kg \cdot m^2$
(C) 3.47 $kg \cdot m^2$
(D) 1.96 $kg \cdot m^2$

Click in the box below and type in your response

✔A

6.

A rod of radius 2.50 cm is subjected to an axial force of 50 kN. What is the axial stress in the rod?

(A) 25.5 MPa
(B) 255 kPa
(C) 160 kPa
(D) 12.6 MPa

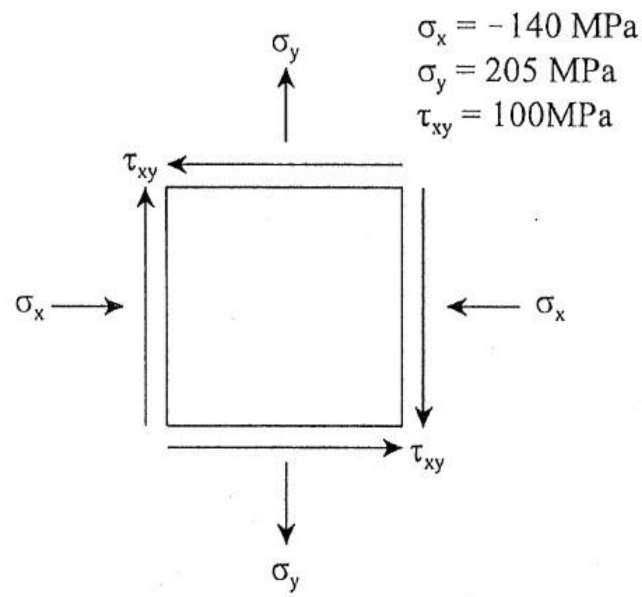
Click in the box below and type in your response

✔A

7.

What are the principal stresses?

(A) 140 MPa, −210 MPa
(B) 200 MPa, −140 MPa
(C) 230 MPa, −200 MPa
(D) 230 MPa, −170 MPa



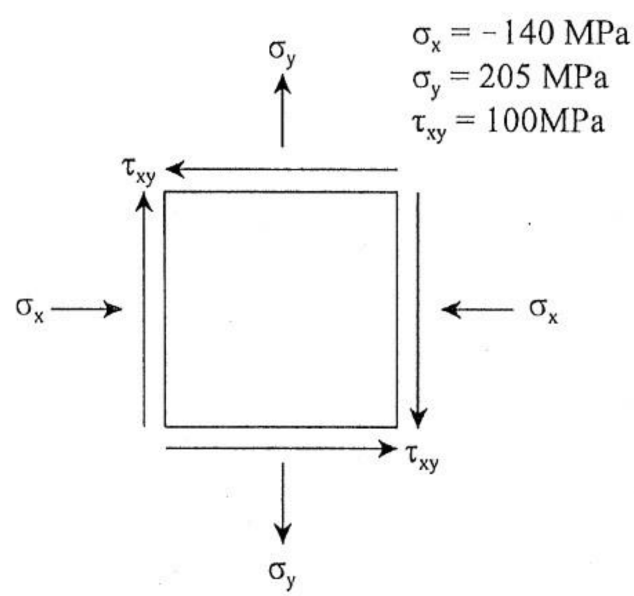
Click in the box below and type in your response

✔D

8.

What is the maximum shear stress

(A) 100 MPa
(B) 160 MPa
(C) 200 MPa
(D) 210 MPa



Click in the box below and type in your response

✔C

9.

A thin-walled cylinder containing a gas has an internal gage pressure of 16 MPa. The diameter of the cylinder is 25 cm. If the steel has an allowable stress of 90 MPa, what is the required thickness of the cylinder wall?

(A) 0.69 cm
(B) 0.95 cm
(C) 1.4 cm
(D) 2.2 cm

Click in the box below and type in your response

✔D

10.

The maximum torque on a 15-cm diameter solid shaft is 13.5 kN·m. What is the maximum shear stress in the shaft?

(A) 20.4 MPa
(B) 22.6 MPa
(C) 27.7 MPa
(D) 33.5 MPa

Click in the box below and type in your response

✔A

11.

A particle starting from rest experiences an acceleration of 3 m/s^2 for 2 s. The particle then decelerates at 2.25 m/s^2 over a distance of 8 m. Assuming all accelerations are constant, what is the total time elapsed for the particle's motion?

(A) 2.67 s
(B) 4.00 s
(C) 4.67 s
(D) 5.33 s
(E) 7.12 s

Click in the box below and type in your response

✔C

12.

The velocity (m/s) of a falling ball is described by the equation $v = 32 + t + 6t^2$. What is the acceleration of the ball at time $t = 2s$?

(A) $9.8\ m/s^2$
(B) $25\ m/s^2$
(C) $32\ m/s^2$
(D) $58\ m/s^2$
(E) $64\ m/s^2$

Click in the box below and type in your response

✔B

13.

The location of a particle moving in the x-y plane is given by the equations:

$$x = t^2 + 4t$$
$$y = t^4/4 - 60t$$

where x and y are measured in meters and t is measured in seconds. What is the velocity of the particle at $t = 4$ s ?

(A) 8.95 m/s
(B) 11.3 m/s
(C) 12.6 m/s
(D) 16.0 m/s
(E) 18.3 m/s

Click in the box below and type in your response

✔C

14.

The elevator in a building has a mass of 1000 kg. Its maximum velocity and acceleration are 2 m/s and 1 m/s^2, respectively. A passenger of mass 75 kg stands on a scale in the elevator as it ascends at its maximum acceleration. What is the scale reading just as the elevator reaches its maximum acceleration?

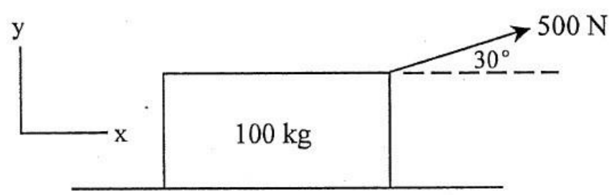
(A) 75 N
(B) 150 N
(C) 811 N
(D) 886 N
(E) 941 N

Click in the box below and type in your response

✔C

15.

A 100-kg block is pulled along a horizontal surface by a 500-N force applied at 30° with respect to the surface. The coefficient of kinetic friction between the block and surface is 0.15. What is the acceleration of the block?



(A) 3.23 m/s^2
(B) 3.80 m/s^2
(C) 4.33 m/s^2
(D) 5.00 m/s^2
(E) 5.12 m/s^2

Click in the box below and type in your response

✔: A

16.

A fluid with a density of 885 kg/m^3 flows through a tube with an inside diameter of 3.75 cm at an average velocity of 3.2 m/s. The mass flow rate is:

(A) 12.5 kg/s
(B) 3.13 kg/s
(C) 3128 kg/s
(D) 0.0313 kg/s

Click in the box below and type in your response

✔B

17.

During a process, 50 kJ of work is done on a closed system while 20 kJ of heat is lost from the system. If the initial internal energy of the system is 90 kJ, what is the final internal energy of the system?

(A) 120 kJ
(B) 60 kJ
(C) 160 kJ
(D) 20 kJ

Click in the box below and type in your response

✔A

18.

A 40-cm diameter sphere with a surface temperature of 125°C loses heat to the surrounding air at 20°C. If the heat transfer coefficient is 30 W/m^2·K, what is the heat transfer?

(A) 1583 W
(B) 3958 W
(C) 504 W
(D) 15.8 W

Click in the box below and type in your response

✔: A

19.

A 12-cm thick plane slab of plastic ($k = 0.2$ W/m·K) experiences a steady, uniform heat flux of 80 W/m^2 on one surface. The temperature difference across the slab is:

(A) 1.92°C
(B) 86°C
(C) 48°C
(D) 133°C

Click in the box below and type in your response

✔C

20.

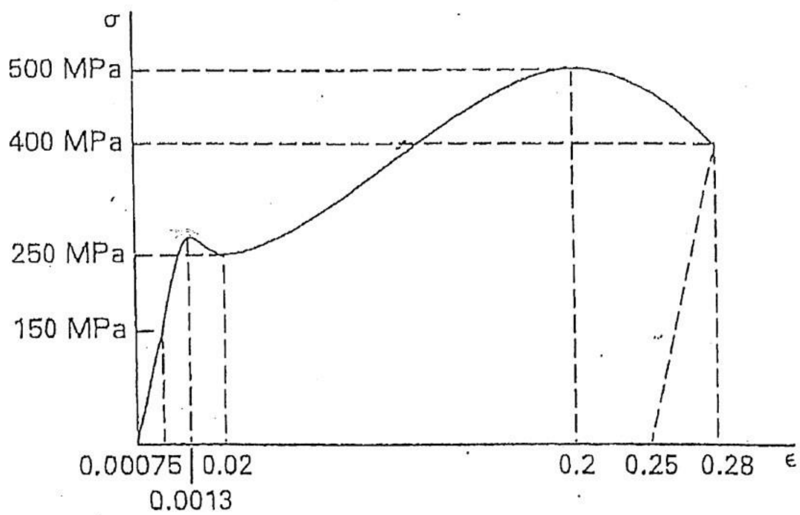
A composite plane wall consisting of three layers of equal thickness of 2.0 cm have thermal conductivities of $k_1 = 1$ W/m·K, $k_2 = 4$ W/m·K and $k_3 = 10$ W/m·K. If the overall temperature difference across the composite wall is 50°C, what is the temperature difference across layer 2?

(A) 46°C
(B) 52°C
(C) 3.7°C
(D) 9.3°C

Click in the box below and type in your response

✔D

21.



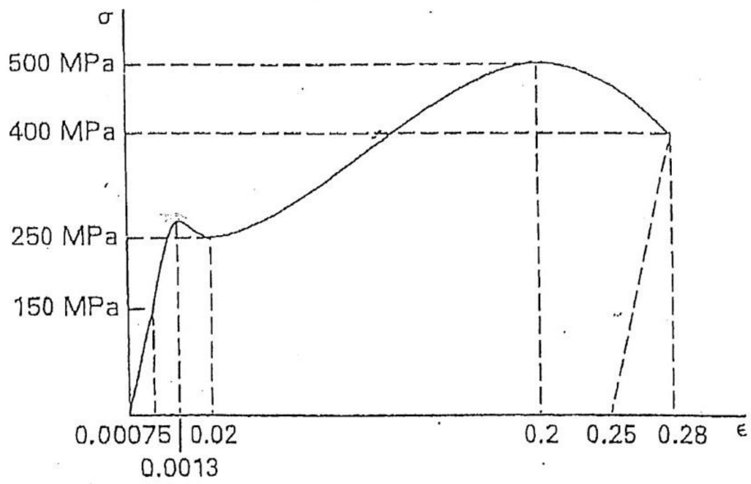
What test is represented by the above diagram?

(A) Resilience test
(B) Rotating beam test
(C) Ductility test
(D) Tensile test
(E) Creep test

Click in the box below and type in your response

✔D

22.



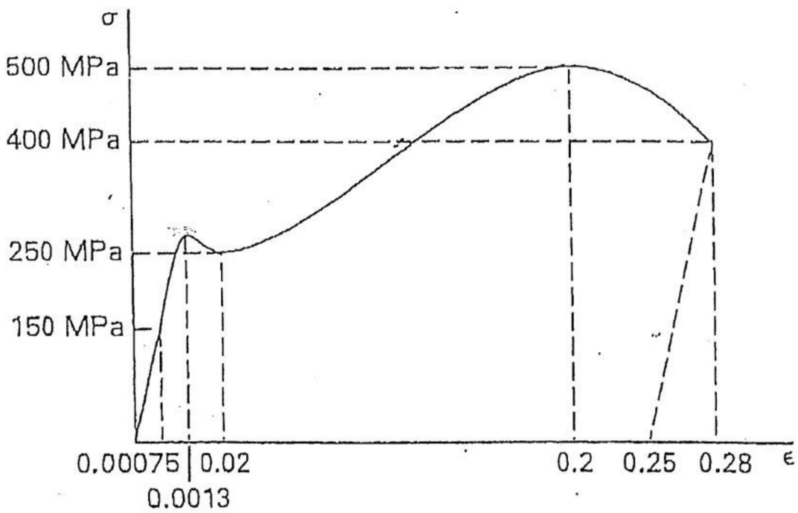
Which of the following is most likely the material that was used to produce these results?

(A) Glass
(B) Concrete
(C) Low carbon steel
(D) Aluminum
(E) Cast iron

Click in the box below and type in your response

C

23.



What is the modulus of elasticity?

(A) 2×10^4 MPa
(B) 8×10^4 Mpa
(C) 12.5×10^4 MPa
(D) 20×10^4 MPa
(E) 150 MPa

Click in the box below and type in your response

✔D

24.

Which of the following characteristics describes martensite?

(A) High ductility
(B) Formed by quenching austenite
(C) High hardness
(D) Easy to machine
(E) Both B and C

Click in the box below and type in your response

✔E

25.

A 6-inch diameter shaft is to be used for power transmission. The material requires through hardness of Rc 55. Which material should be chosen?

(A) 6061-T6
(B) SAE 4340
(C) SAE 1095
(D) SAE 4130
(E) 304 stainless

Click in the box below and type in your response

✔B

26.

A belt drive operates with sheave sizes of 5.25 in and 13.95 in. If the center distance (C) is specified at 24 in, what is the theoretical belt length required?

(A) 61.35 in
(B) 70.25 in
(C) 78.93 in
(D) 84.12 in
(E) 89.02 in

Click in the box below and type in your response

✔C

27.

A chain with a 0.75 in pitch is designed to run on sprockets having 15 and 50 teeth, respectively. If the center distance of the sprockets is specified to be 36 in, what is the length of chain required in pitches? (Round to the nearest even number of pitches).

(A) 130 pitches
(B) 132 pitches
(C) 136 pitches
(D) 138 pitches
(E) 140 pitches

Click in the box below and type in your response

✔A

28.

A pinion and gear are running in mesh. The gear pair has a diametral pitch of 6. has 24 teeth, what is the corresponding pitch diameter of the pinion?

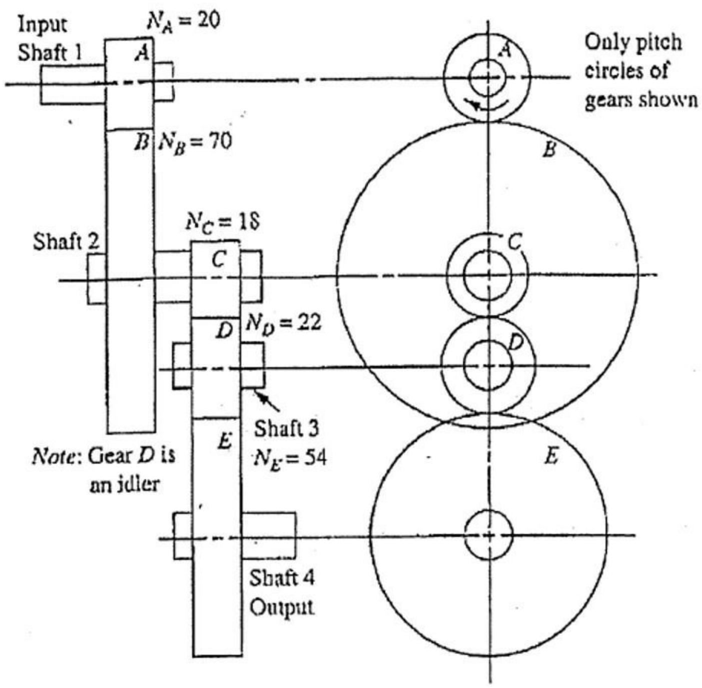
(A) 2 in
(B) 3 in
(C) 4 in
(D) 5 in
(E) 6 in

Click in the box below and type in your response

C

29.

A shaft carrying gear "A" rotates at 1750 rpm clockwise. What is the rotational speed and rotational direction of the output gear "E"? (Refer to the figure below).



(A) 166.7 rpm, CW
(B) 166.7 rpm, CCW
(C) 203.7 rpm, CW
(D) 203.7 rpm, CCW
(E) 409.1 rpm, CCW

Click in the box below and type in your response

B

30.

A radial ball bearing has a basic dynamic load rating of 2350 lb for a rated L10 life of one million revolutions. What would its L10 life be at a radial load of 1675 lb?

(A) 1.75×10^6 revolutions
(B) 1.90×10^6 revolutions
(C) 2.25×10^6 revolutions
(D) 2.50×10^6 revolutions
(E) 2.76×10^6 revolutions

Click in the box below and type in your response

✔E

31. Engineers, in the fulfillment of their professional duties, must carefully consider the safety, health, and welfare of the public.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

32. Engineers may perform services outside of their areas of competence as long as they inform their employers or clients.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

33. Engineers may issue subjective and partial statements if such statements are in writing and consistent with the best interests of their employers, clients, or the public.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

34. Engineers shall act for each employer or client as faithful agents or trustees.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

35. Engineers shall not be required to engage in truthful acts when required to protect the public health, safety, and welfare.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

B

36. Engineers may not be required to follow the provisions of state or federal law when such actions could endanger or compromise their employer or their clients' interests.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

B

37. If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employers or clients and such other authority as may be appropriate.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

A

38. Engineers may review but shall not approve those engineering documents that are in conformity with applicable standards.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

B

39. Engineers shall not reveal facts, data, information without the prior consent of the client or employer except as authorized or required by law or this Code.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

A

40. Engineers shall not permit the use of their names or associates in business ventures with any person or firm that they believe is engaged in fraudulent or dishonest enterprise, unless such enterprise or activity is deemed consistent with applicable state or federal law.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

41. Engineers having knowledge of any alleged violation of this Code, following a period of 30 days during which the violation is not corrected, shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

42. Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

43. Engineers shall not affix their signatures to plans or documents dealing with subject matter in which they lack competence, but may affix their signatures to plans or documents not prepared under their direction and control where they have a good faith belief that such plans or documents were competently prepared by another designated party.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

44. Engineers may accept assignments and assume responsibility for coordination of an entire project and shall sign and seal the engineering documents for the entire project, including each technical segment of the plans and documents.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

45. Engineers shall strive to be objective and truthful in professional reports, statements or testimony, with primary consideration for the best interests of the engineers' clients or employers. The engineers' reports shall include all relevant and pertinent information in such reports, statements, or testimony, which shall bear the date on which the engineers were retained by the clients to prepare the reports.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

46. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

47. Engineers shall not issue statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties, unless they have prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking and revealing the existence of any interest the engineers may have in the matters.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

48. Engineers may not participate in any matter involving a conflict of interest if it could influence or appear to influence their judgment or the quality of their services.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

49. Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

50. Engineers shall not solicit but may accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible, if such compensation is fully disclosed.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

51. Engineers in public service as members, advisors, or employees of a governmental or quasi-governmental body or department may participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice as long as such decisions do not involve technical engineering matters for which they do not posses professional competence.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

52. Engineers shall not solicit nor accept a contract from a governmental body on which a principal or officer of their organization serves as a member.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

53. Engineers shall not intentionally falsify their qualifications nor actively permit written misrepresentation of their or their associate's qualifications. Engineers may accept credit for previous work performed where the work was performed during the period the engineers were employed by the previous employer. Brochures or other presentations incident to the solicitation of employment shall specifically indicate the work performed and the dates the engineers were employed by the firms.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

54. Engineers shall not offer, give, solicit, nor receive, either directly or indirectly, any contribution to influence the award of a contract by a public authority, or which may be reasonably construed by the public as having the effect or intent of influencing the award of a contract unless such contribution is made in accordance with applicable federal or state election campaign finance laws and regulations.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

55. Engineers shall acknowledge their errors after consulting with their employers or clients.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

56. The three paradigms of management of diversity are assimilation paradigm, differentiation paradigm, and integration paradigm.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

57. The integration paradigm states intends that people of color and women are fully integrated into all aspects of an organization.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

58. Gender diversity refers to the proportion of women in the workforce.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

59. The frequency of discrimination on the basis of age appears to be decreasing.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

60. The trend for racial diversity in the United States is expected to decrease.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

61. When racially diverse employees are forced to work together in order to complete a project, there is a greater likelihood that positive interpersonal relationships will develop.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

62. Affirmative action's goal is to remedy the under-representation of women and minorities through emphasis on hiring and promotions.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

63. Having a critical mass of diverse employees in a work group tends to cause problems in interpersonal relations.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

64. It is not the role of management to ensure a workplace free of remarks or jokes that could be offensive to employees.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

65. It is the role of management to ensure that employees are treated with respect and dignity.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

66. Employees of different ages spanning generations is an example of diversity in the workplace.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

67. Despite progress, there still exists biases in the workplace based on race, gender or age.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

68. Management can legally make hiring decisions based on an applicant's race, gender, or age.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔B

69. A "like me bias" is when a manager unintentionally evaluates people's performance more highly because they share a similar background or are deemed the same type person.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

70. Mentoring is one effective tool managers can use to better integrate minorities or women into an organization.

(A) TRUE
(B) FALSE

Click in the box below and type in your response

✔A

Mechanical Engineering Technology								
COURSE	**MET 3150 Engineering Technology Materials**							
SEMESTER	**Fall/Spring**							
YEAR	**2019-2020**						S = 1 or 2: action initiated by instructor	
INSTRUCTOR	**Daniel J.**						S = 3 or 4: no action initiated by instructor	
Outcome #4 an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes								
Performance Indicator (PI)	Student Outcomes	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Exemplary	Score (S)	Initiate by	Action to be initiated
Perform a Rockwell Hardness measurement in accordance with the ASTM E18-20 standard.	4	Doesn't understand the importance of metal Rockwell hardness in the engineering context	Does understand the importance of the measurements, but doesn't understand the nuances of the procedure or machine	Does understand the importance of the measurements and procedure, but doesn't understand how to interpret the data	Understands the measurement, the correct procedure, and interprets the data accurately	**4**	no	
Perform a Jominy End Quench Test Measurement in accordance with the ASTM E255-20 standard.	4	Doesn't understand the importance of metal Jominy End Quench measurement in the engineering context	Does understand the importance of the measurements, but doesn't understand the nuances of the procedure	Does understand the importance of the measurements and procedure, but doesn't understand how to interpret the data	Understands the measurement, the correct procedure, and interprets the data accurately	**2**	D. Magda Professor	Set up a pre-lab in class that describes the heat treatment process with phase changes and crystal structure change
Perform a tensile test measurement in accordance with the ASTM E8-20 standard.	4	Doesn't understand how to set up the tensile test machine nor understand the Instron machine setup	Can take set up machine and take measurements, but doesn't understand how to interpret the data	Occasional errors in obtaining data and in data interpretation	Successfully sets up machine, takes data, and interprets the data accurately	**1.5**	D. Magda Professor	Video record the process and procedure from start to finish of the ASTM tensile test for a basic carbon steel. Students will be able to review the recording mutilpe times to understand
Perform an Impact test measurement in accordance with the ASTM E23-18 standard.	4	Doesn't understand how to set up the Impact test machine nor understand the correct machine setup for a Charpy test	Can take set up machine and take measurements, but doesn't understand how to interpret the data	Occasional errors in obtaining data and in data interpretation	Successfully sets up machine, takes data, and interprets the data accurately	**3**	no	
					Average Score for	**2.5**		

Mechanical Engineering Course Rubric							
COURSE	**MET 3400 Machine Design**						
SEMESTER	**Spring**						
YEAR	**2021**					S = 1 or 2: action initiated	
INSTRUCTOR	**Birch**	(Transfer this number to course continuous improvement record kept by dept. chair)				S = 3 or 4: no action	
Performance Indicator (PI)	Student Outcomes	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Exemplary	Score (S)	Initiate action by instructor ?
Understands powertrain analysis, and can apply engineering and mathematical tools to predict the mechanism performance.	1	Cannot appropriately analyze a powertrain.	Can apply some knowledge of powertrain analysis, but cannot analyze complex arrangements of power transmitting components.	Can apply appropriate strategies for design and analysis of powertrains. For complex powertrain arrangements, appropriate predictions of performance are achieved.	Nearly always applies appropriate strategies for design and analysis of powertrains. For very complex powertrain arrangments, appropriate predictions of performance are achieved.	**4**	NO
Understands how to design an appropriate bolted connection, utilizing skills in designing components based on broad based engineering problems.	2	Cannot appropriately design a bolted connection.	Can apply some knowledge of the design of bolted connections, but cannot consistently achieve a suitable engineered solution.	Can apply knowledge of the design of bolted connections, and can consitently achieve a suitable engineered solution.	Nearly always applies knowledge of the design of bolted connections, and can consitently achieve a suitable engineered solution.	**3**	NO
Can interpret test data to analyze a column for compressive buckling.	4	Cannot appropriately interpret material test data to design a column for buckling.	Can appropriately interpret some material test data to design a column for buckling, but cannot consistently achieve a suitable engineered solution.	Can appropriately interpret material test data and can consistently design a column for buckling.	Nearly always interprets material test data correctly, and can use it to design a column for buckling.	**3**	NO
					Average Score for Course =	**3.3**	

Mechanical Engineering Course Rubric

COURSE	**MET 3500 Measurement and Instrumentation**
SEMESTER	**Fall**
YEAR	**2020**
INSTRUCTOR	**Randy Hurd**

S = 1 or 2: action initiated by instructor
S = 3 or 4: no action initiated by instructor

Performance Indicator (PI)	Student Outcomes	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Exemplary	Score (S)	Initiate action by instructor ?	Action to be initiated
Students can collect, plot and describe measurement data.	5	Collected data do not appear to have been collected carefully. Student has forgotten major component of plotted data such as an axis label or axis ranges are poorly chosen. Student has not included caption.	Collected data appear to have been collected carefully. Axes are labeled. Plot caption accurately describes trends.	Collected data appear to have been collected appropriately. Axes are labeled with titles and units. Plot caption accurately describes trends.	Collected data appear to have been collected both appropriately and carefully. Axis ranges are appropriate, and axes are labled with titles and units. Data markers and/or line type choices do not distract. Plot caption accurately describes trends and makes inferences from observations.	4	no	N/A
Students can appropriately calculate and apply a z-score and/or t-score.		<50%	>50%	>70%	>90% of students are able to calculate the correct z-score value (or t-score) to predict the percentage of data that would be expected to fall above or below a given value.	3	no	N/A
Students can calculate random and systematic uncertainty.		<50%	>50%	>70%	>90% of students accuractely calculated random and systematic uncertainy given a set of data and the necessary instrument specifications.	2	yes	Added additional lecture to review differences between random and systematic uncertainty. Worked through two examples in class.
Students can calculate propagated uncertainty.		<50%	>50%	>70%	>90% of students accuractly calculated propagated uncertainty.	2	yes	Added additinoal lecture to review propagated uncertainty. Worked through problem in class.
Students can select necessary minimum sampling frequency for a given signal (application of Nyquist frequency).		<50%	>50%	>70%	>90% of students can identify the mimimum required sampling frequency, given the maximum possible frequency of a signal to be measured.	3	no	
Students can apply a Fast Fourier Transform (FFT) to identify the dominant frequency in a given signal.		<50%	>50%	>70%	>90% of the students can identify the dominant frequency from a noisy signal by applying an FFT.	3	no	
Students can calculate fundamental instrument responce parameters such as rise time.		<50%	>50%	>70%	>90% of students calculated the correct rise time from a provided data set.	3	no	
Students demonstrate a basic knowledge of when to use a low-pass filter.		<50%	>50%	>70%	>90% of the students can correctly select a low-pass filter to eliminate high frequency noise from a signal.	4	no	
Students demonstrate an understanding of basic electrical concepts such as capacitance.		<50%	>50%	>70%	>90% students can correctly identify how changing an attribute of a capacitor will change the resulting capacitance.	4	no	
Students demonstrate the ability to perform a calibration on a common instrument (thermocouple).		<50%	>50%	>70%	>90% can correctly calculate the appropriate transfer fucntion from a provided data set.	**3**	no	
					Average Score for Course =	**3.1**		

(Transfer this number to course continuous improvement record kept by dept. chair)

Mechanical Engineering Course Rubric								
COURSE	**MET 3700 Testing & Failure Analysis**							
SEMESTER	**Fall**							
YEAR	**2020**					S = 1 or 2: action initiated S = 3 or 4: no action		
INSTRUCTOR	**Birch**	(Transfer this number to course continuous improvement record kept by dept.						
Performance Indicator (PI)	Student Outcomes	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Exemplary	Score (S)	Initiate action by instructor ?	
Understands stress analysis, and can apply appropriate engineering and mathematical tools to predict material performance.	1	Cannot appropriately calculate stress.	Can apply some knowledge of stress analysis, but cannot consistently analyze atypcial shapes.	Can apply appropriate strategies for stress analysis. For atypical shapes, appropriate predictions of stress are achieved.	Nearly always applies appropriate strategies for stress analysis. For atypical shapes, appropriate predictions of stress are achieved.	**4**	NO	
Understands how to assess design risk based on broad based reliability and failure rate information. Can use this information to asign RPN in an	2	Cannot appropriately assess design risk.	Can apply some knowledge of design risk, but cannot consistently assign an RPN in FMEA.	Can apply knowledge of design risk, and can consitently assign an RPN in FMEA.	Nearly always applies knowledge of design risk, and can consitently assign an RPN in FMEA.	**4**	NO	
Can interpret test requirements to appropriately design a beam fatigue test.	4	Cannot appropriately interpret test requirements to design a beam fatigue test.	Can appropriately interpret some test requirements to design a beam fatigue test, but cannot consistently achieve a suitable engineered solution.	Can appropriately interpret test requirements to design a beam fatigue test and consistently achieves a suitable engineered soluiton.	Nearly always appropriately interprets test requirements to design a beam fatigue test and consistently achieves a suitable engineered soluiton.	**4**	NO	
					Average Score for Course =			