



Course Syllabus

ENER 1330 - Basic Mechanical Skills for Energy

Revision Date: 8/21/13

Catalog Description: Basic mechanical skills using hand and power tools in an industrial environment. Topics include tool use and maintenance, lubrication, measuring, threads and fasteners, bench works, basic mechanical drawings, and basic shop calculations (English and metric). Also addresses rigging procedures to include chain falls, jacks, cable, fulcrum, port-a-power, and come-alongs.

Lecture hours = 2,

Lab hours = 3

Prerequisites: None

Semester Credit Hours: 3

Lecture Hours per Week: 2

Lab Hours per Week: 3

Contact Hours per Semester: 80

State Approval Code: 1505030000

Instructional Goals and Purposes: Use basic hand, hand power, and stationary power tools; select appropriate Bill of Materials (BOM); interpret basic mechanical drawings and perform associated calculations; apply measuring tools; perform bench work including part layout, drilling, reaming, tapping, press fitting, location of hole centers; perform preventative maintenance on tools; describe basic lubrication practices; demonstrate basic rigging procedures; and employ good housekeeping, environmental awareness, safety procedures, sensory skills, and preventative maintenance.

Learning Outcomes:

1. List and describe a four stroke-engine cycle.
2. List seven rules to follow when using automotive testing equipment.
3. Summarize thread and bolt specifications.
4. Describe the three main electrical elements.
5. Identify the six most common types of accidents related to engines.
6. Identify the different engine cylinder arraignments.
7. List and describe the two types of cooling systems.
8. Explain the three types of bore/stoke ratios.
9. Explain how crude oil is converted into gasoline, diesel, and other products.

Specific Course Objectives (includes SCANS):

After studying all materials and resources presented in the course, the student will be able to:

1. **List and describe a four stroke-engine cycle.** (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Describe the intake stroke.
 - b. Describe the compression stroke.

- c. Describe the power stroke.
 - d. Describe the exhaust stroke.
2. **List seven rules to follow when using automotive testing equipment.** (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Demonstrate the ability to select the proper engine service tools when performing engine repairs.
 - b. Demonstrate the ability to use precision measuring tool accurately.
 - c. Describe the function of commonly used engine test equipment.
 3. **Summarize thread and bolt specifications.** (1 A-I, 1A-ii, 1Aiv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C-ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Demonstrate the proper use of a torque wrench.
 - b. Identify common thread specifications.
 - c. Describe how to repair fastener damage.
 4. **Describe the three main electrical elements.** (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Describe the function of basic electrical components.
 - b. Define Ohms law
 - c. Define Amperes
 - d. Define Volts
 - e. Define Watts
 - f. Define Ohms.
 5. **Identify the six most common types of accidents related to engines.** (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Identify fire hazards.
 - b. Identify asphyxiation hazards.
 - c. Identify hazardous wast.
 - d. Describe the use of MSDS sheets.
 6. **Identify the different engine cylinder arraignments.** (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Identify an in-line engine
 - b. Identify a V-block
 - c. Identify a rotary engine
 - d. Explain cylinder numbering and firing order.
 7. **List and describe the two types of cooling systems.** (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Describe the liquid cooled engine
 - b. Describe the air cooled engine
 - c. Identify water jacket arrangements.
 8. **Explain the three types of bore/stroke ratios.** (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C-ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Explain engine bore,stroke, and displacement.
 - b. Describe how the calculate engine displacement.
 - c. Explain compression ratio.
 9. **Explain how crude oil is converted into gasoline, diesel, and other products.** (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
 - a. Explain the distillation process
 - b. Define the separation temperature for different liquids in crude oil.
 - c. Explain the refining process.

Course Content:

Students in all sections of this course will be required to do the following:

1. Quizzes will be administered on Canvas or on paper after the completion of each chapter.

2. Students will be administered a cumulative final at the end of the semester.
3. Students will be expected to complete lab exercises using proper safety procedures and complete required task with ease.

Methods of Instruction/Course Format/Delivery:

This course will be taught as a weekly lecture and/ or lab. Students will need access to the internet for use of Canvas. Face to face labs will be held once a week.

Assessment:

The following items will be assigned during the semester and used to calculate the student's final grade:

- **Quizzes** - Quizzes will be given at the end of each chapter covered, that will consist of multiple choice and fill in the blank questions. Quizzes will be administered either in paper form or Canvas online platform.
- **Lab**-Throughout the semester there will be lab exercises both virtual and hands on. Students will be assessed on his or hers ability to complete the task with minimal assistance.
- **Attendance and participation**-Students are expected to attend class and to be on time. Students are also required to participate with other students during class exercises.
- **Final Exam** - There will be a cumulative final given in one or two parts that will span the students various skills and will including lab exercises.

Course Grade:

The grading scale for this course is as follows:

- Final Exams = 40%
- Quizzes = 20%
- Lab assignments = 20%
- Attendance and Participation = 10%
- Student Learning Assessment = 10%

Texts, Materials, and Supplies:

- *Auto Engine Repair* by James E. Duffy and John Hurt
- *Hard hat, ear plugs, and safety glasses required in lab.*
- *Calculator*

Other:

- For current texts and materials, use the following link to access bookstore listings: <http://www.panolacollegestore.com>
- For testing services, use the following link: <http://www.panola.edu/elearning/testing.html>
- If any student in this class has special classroom or testing needs because of a physical learning or emotional condition, please contact the ADA Student Coordinator in Support Services located in the Administration Building or go to <http://www.panola.edu/student-success/disability-support-services/> for more information.
- Withdrawing from a course is the student's responsibility. Students who do not attend class and who do not withdraw will receive the grade earned for the course.
- Student Handbook, *The Pathfinder*: <http://www.panola.edu/student-success/documents/pathfinder.pdf>

SCANS CRITERIA

1. Foundation skills are defined in three areas: basic skills, thinking skills, and personal qualities.

- a. **Basic Skills:** A worker must read, write, perform arithmetic and mathematical operations, listen, and speak effectively. These skills include:
 - i. Reading: locate, understand, and interpret written information in prose and in documents such as manuals, graphs, and schedules.
 - ii. Writing: communicate thoughts, ideas, information, and messages in writing, and create documents such as letters, directions, manuals, reports, graphs, and flow charts.
 - iii. Arithmetic and Mathematical Operations: perform basic computations and approach practical problems by choosing appropriately from a variety of mathematical techniques.
 - iv. Listening: receive, attend to, interpret, and respond to verbal messages and other cues.
 - v. Speaking: Organize ideas and communicate orally.
- b. **Thinking Skills:** A worker must think creatively, make decisions, solve problems, visualize, know how to learn, and reason effectively. These skills include:
 - i. Creative Thinking: generate new ideas.
 - ii. Decision Making: specify goals and constraints, generate alternatives, consider risks, and evaluate and choose the best alternative.
 - iii. Problem Solving: recognize problems and devise and implement plan of action.
 - iv. Visualize ("Seeing Things in the Mind's Eye"): organize and process symbols, pictures, graphs, objects, and other information.
 - v. Knowing How to Learn: use efficient learning techniques to acquire and apply new knowledge and skills.
 - vi. Reasoning: discover a rule or principle underlying the relationship between two or more objects and apply it when solving a problem.
- c. **Personal Qualities:** A worker must display responsibility, self-esteem, sociability, self-management, integrity, and honesty.
 - i. Responsibility: exert a high level of effort and persevere toward goal attainment.
 - ii. Self-Esteem: believe in one's own self-worth and maintain a positive view of oneself.
 - iii. Sociability: demonstrate understanding, friendliness, adaptability, empathy, and politeness in group settings.
 - iv. Self-Management: assess oneself accurately, set personal goals, monitor progress, and exhibit self-control.
 - v. Integrity and Honesty: choose ethical courses of action.

2. Workplace competencies are defined in five areas: resources, interpersonal skills, information, systems, and technology.

- a. **Resources:** A worker must identify, organize, plan, and allocate resources effectively.
 - i. Time: select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
 - ii. Money: Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.
 - iii. Material and Facilities: Acquire, store, allocate, and use materials or space efficiently. Examples: construct a decision time line chart; use computer software to plan a project; prepare a budget; conduct a cost/benefits analysis; design an RFP process; write a job description; develop a staffing plan.

- b. **Interpersonal Skills:** A worker must work with others effectively.
- i. Participate as a Member of a Team: contribute to group effort.
 - ii. Teach Others New Skills.
 - iii. Serve Clients/Customers: work to satisfy customer's expectations.
 - iv. Exercise Leadership: communicate ideas to justify position, persuade and convince others, responsibly challenge existing procedures and policies.
 - v. Negotiate: work toward agreements involving exchange of resources, resolve divergent interests.
 - vi. Work with Diversity: work well with men and women from diverse backgrounds.
- Examples: collaborate with a group member to solve a problem; work through a group conflict situation, train a colleague; deal with a dissatisfied customer in person; select and use appropriate leadership styles; use effective delegation techniques; conduct an individual or team negotiation; demonstrate an understanding of how people from different cultural backgrounds might behave in various situations.
- c. **Information:** A worker must be able to acquire and use information.
- i. Acquire and Evaluate Information.
 - ii. Organize and Maintain Information.
 - iii. Interpret and Communicate Information.
 - iv. Use Computers to Process Information.
- Examples: research and collect data from various sources; develop a form to collect data; develop an inventory record-keeping system; produce a report using graphics; make an oral presentation using various media; use on-line computer data bases to research a report; use a computer spreadsheet to develop a budget.
- d. **Systems:** A worker must understand complex interrelationships.
- i. Understand Systems: know how social, organizational, and technological systems work and operate effectively with them.
 - ii. Monitor and Correct Performance: distinguish trends, predict impacts on system operations, diagnose deviations in systems' performance and correct malfunctions.
 - iii. Improve or Design Systems: suggest modifications to existing systems and develop new or alternative systems to improve performance.
- Examples: draw and interpret an organizational chart; develop a monitoring process; choose a situation needing improvement, break it down, examine it, propose an improvement, and implement it.
- e. **Technology:** A worker must be able to work with a variety of technologies.
- i. Select Technology: choose procedures, tools or equipment including computers and related technologies.
 - ii. Apply Technologies to Task: understand overall intent and proper procedures for setup and operation of equipment.
 - iii. Maintain and Troubleshoot Equipment: Prevent, identify, or solve problems with equipment, including computers and other technologies.
- Examples: read equipment descriptions and technical specifications to select equipment to meet needs; set up and assemble appropriate equipment from instructions; read and follow directions for troubleshooting and repairing equipment.