



# INMT 2303 - Pumps, Compressors & Mechanical Drives Course Syllabus

## Description

A study of the theory and operations of various types of pumps and compressors. Topics include mechanical power transmission systems including gears, v-belts and chain drives.

**Credits** 3

**Lecture Hours** 2

**Lab Hours** 3

**Extended Hours** 0

**Contact Hours** 80

**State Approval Code** 15.0613

**Instructor Name** Jason Ryan

**Semester/Year** Fall 2024

## Meeting Time and Location

Mondays 03:25PM - 05:25PM MEB 1140

## Alternate Operations During Campus Closure

In the event of an emergency or announced campus closure due to a natural disaster or pandemic, it may be necessary for Panola College to move to altered operations. During this time, Panola College may opt to continue delivery of instruction through methods that include, but are not limited to: online learning management system (CANVAS), online conferencing, email messaging, and/or an alternate schedule. It is the responsibility of the student to monitor Panola College's website ([www.panola.edu](http://www.panola.edu)) for instructions about continuing courses remotely, CANVAS for each class for course-specific communication, and Panola College email for important general information.

## Student Basic Needs

Unexpected circumstances may arise, but Panola College offers various resources to support students. If you need mental health services or are facing challenges with transportation, affording class materials and supplies, or accessing food regularly—issues that may impact your class performance—please visit [panola.edu/resources](http://panola.edu/resources).

## Class Attendance

Regular and punctual attendance of classes and laboratories is required of all students. When a student has been ill or absent from class for approved extracurricular activities, he or she should be allowed, as far as possible, to make up for the missed work. If a student has not actively participated by the census date, they will be dropped by the instructor for non-attendance. This policy applies to courses that are in-person, online, hybrid, and hybrid.

Attendance in online courses is determined by submission of an assignment or participation in an activity. According to federal guidelines, simply logging into a distance learning course without participating in an academic assignment does not constitute attendance. Distance learning is defined as when a majority (more than 50%) of instruction occurs when the instructor and students are in separate physical locations. Students must engage in an academic activity prior to the course census date.

When an instructor feels that a student has been absent to such a degree as to invalidate the learning experience, the instructor may recommend to the Vice President of Instruction that the student be withdrawn from the course. Instructors may seek to withdraw students for non-attendance after they have accumulated the following number of absences:

Fall or spring semesters:

3 or more class meeting times per week - 5 absences

2 class meeting times per week - 3 absences

1 class meeting per week - 2 absences

The student is responsible for seeing that he or she has been officially withdrawn from a class. A student who stops attendance in a class without officially withdrawing from that class will be given a failing grade; consequently, the student must follow official withdrawal procedures in the Admissions/Records Office.

Please note: Health Science and Cosmetology courses may require more stringent attendance policies based on their accreditation agencies. Please see the addendum and/or program handbook for further information concerning attendance.

### **Pregnant/Parenting Policy**

Panola College welcomes pregnant and parenting students as a part of the student body. This institution is committed to providing support and adaptations for a successful educational experience for pregnant and parenting students. Students experiencing a need for accommodations related to pregnancy or parenting will find a Pregnancy and Parenting Accommodations Request form in the Student Handbook or may request the form from the course instructor.

### **Artificial Intelligence (AI) Course Policy**

**Use of generated AI Permitted under some classroom circumstances with permission.**

There are situations throughout the course where you may be asked to use artificial intelligence (AI) tools to explore how they can be used. Outside of those circumstances, you should not use AI tools to generate content that will end up in any student work (assignments, activities, discussion responses, etc.). In such cases for Option #2, no more than 25% of the student work should be generated by AI. Use of any AI-generated content in this course without the instructor's consent qualifies as academic dishonesty and violates Panola College's standards of academic integrity.

### **Instructional Goals and Purposes**

Identify the principle involved in the operation of centrifugal and positive displacement pumps and compressors; identify the function of various components in pumps and compressors, disassemble and reassemble pumps, compressors, and mechanical drives, and troubleshoot pumps, compressors, and mechanical drives.

### **Learning Outcomes**

1. Discuss the general safety practices for mechanical systems and how to mount and level an electric motor.
2. Discuss the use of a key fastener to connect a motor to a mechanical load
3. Discuss the two important power transmission components: bearings and couplings
4. Discuss how to couple a power transmission system with the use of V-belts
5. Discuss how to couple a power transmission system with the use of roller chains
6. Discuss how to couple a power transmission system with the use of spur gears
7. Describe the basic principles of pumps and hydraulics
8. Describe the basic principles of compressors as used in the Oil and Gas Industry

### **Specific Course Objectives (includes SCANS)**

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

1. Discuss the general safety practices for mechanical systems and how to mount and level an electric motor. (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 a mechanical power transmission system and give examples.

- b. Describe the five methods of rotary mechanical power transmission and give an application of each.
  - c. Describe the rules of safe dress for working with power transmission equipment.
  - d. Describe and operate the lockout/tag-out system.
2. Discuss the use of a key fastener to connect a motor to a mechanical load. (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 and operation of a key fastener.
  - b. Describe how to measure the actual size of a key and key seat.
  - c. Describe how to calculate rotary mechanical power.
3. Discuss the two important power transmission components: bearings and couplings. (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 a shaft and how shafts are specified
  - b. Describe the function of a bearing and its types.
  - c. Demonstrate how to mount and dismount bearings and couplings on a power transmission system.
  - d. Describe the purpose of shaft alignment.
  - e. Demonstrate the procedure of aligning shafts on a power transmission system.
4. Discuss how to couple a power transmission system with the use of a V-belt. (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 different types of belt drives and how to install them.
  - b. Describe how to determine belt tension.
  - c. Describe the different methods of measuring belt tension
  - d. Demonstrate the mountings and adjustment of a V-belt.
5. Discuss how to couple a power transmission system with the use of roller chains. (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 the basic components of the chain drive and how to calculate the speed and torque of a chain drive system.
  - b. Describe and demonstrate how to install, align, and remove a roller chain drive system.
  - c. Describe and demonstrate how to determine allowable chain sag for a given application.
  - d. Describe the function of a master link and how to install and remove a chain with a master link.
6. Discuss how to couple a power transmission system with the use of spur gears. (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 concepts of the gear drive system.
  - b. Describe how to calculate the shaft speed and torque of a gear train drive system.
  - c. Describe the operation of a spur gear drive.
  - d. Demonstrate how to install and align a spur gear drive system.
7. Describe the basic principles of pumps and hydraulics. (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. Discuss the basic principles of fluid power.
  - b. Discuss the principles and applications of centrifugal pumps.
  - c. Discuss the principles and applications of gear-type pumps.
  - d. Discuss the principles and applications of reciprocating pumps.
8. Describe the basic principles of compressors as used in the Oil and Gas Industry. (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. Discuss the basic principles of compression of gases and liquids.
  - b. Discuss the principles and applications of reciprocating compressors.

### Course Content

A general description of lecture/discussion topics included in this course is listed in the Learning Objectives / Specific Course Objectives sections of this syllabus.

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

1. Students will study assigned materials and complete quizzes and exams to assess understanding and comprehension.
2. Students will complete all lab assignments as scheduled and all students are required to wear Personal Protective Equipment (PPE) in the lab.

## **Methods of Instruction/Course Format/Delivery**

Students in traditional, hybrid, and Internet classes will have access to courses via Canvas. Students in the traditional class will meet regularly for lectures. Students in the Internet class will be required to take quizzes and exams at an approved testing facility or, they may also be administered by the instructor. Students in hybrid classes will have both in-class and online assignments. Hybrid classes are required to read the assigned material, take quizzes and exams as assigned by the instructor, and complete assigned homework before meeting for the face-to-face labs. Resources for this course, provided through Canvas, include the following Sections in Canvas...

- Modules: Chapter study materials, self-assessment exercises, quizzes, and exams
- Announcements and Recent Activities List: Instructor Announcements
- Inbox: Email (to communicate with instructor and classmates inside Canvas)
- Grades: Student grades
- Other sections, as assigned by the Instructor: Students in both the traditional and internet classes should use the People feature within Canvas (includes Canvas Email) to communicate with the instructor. Using Canvas Email located in the "Inbox" menu gives the student access to the instructor and other classmates without having to remember or type email addresses; the student just selects a name from the list. The instructor will attempt to respond to all Canvas emails within 24 hours. For example, if a student makes an appointment with the instructor through Canvas email to take an exam, the instructor will reply to the student's Canvas email – if the instructor does not reply within the time needed, call the instructor at his or her office. Please, always include in the subject line of the Canvas email, the student's name have course number, and course section number.

## **Major Assignments/Assessments**

The following items are assigned and assessed during the semester and used to calculate the student's final grade.

### **Assignments**

Hands-on lab exercises will be conducted with one or more students in a group, full participation and demonstration of the skill are required to pass the skill and move to the next.

- Exams

Multiple exams may be given during the semester with the final exam being cumulative in one or two parts, which will assess the student's various skills and may include lab exercises.

- Attendance

Students are expected to attend face-to-face classes and labs and be on time. Students are also required to participate with other students during class exercises. Attendance is based on the student missing no more than 10% of the semester without a valid excuse. After the 10%, the instructor will withdraw the student from the course. Any student thirty or more minutes late will be counted absent. Students that leave before the class is released will be counted absent.

- Quizzes

After working through the chapter or chapters and completing the assignments, the student will take online or paper quizzes over the chapters studied. Quizzes will generally contain

True/False, Multiple Choice, Matching, and/or Fill In-The-Blank questions.

- Lab Exercises

Weekly lab exercises and or assignments will be administered during face-to-face meetings as assigned by the instructor.

### **Assessments**

- **Grading Notes:**

**Late Work:** All listed assignments are due according to the due date provided in Canvas and on the course calendar if you do not complete the assignments on time a **5% per day penalty** will automatically be applied to all assignments. If you have missed an assignment due to an approved class absence please contact your instructor for further instructions.

**Missed Exams:** Missed exams due to legitimate reasons should be taken before the reporting of a midterm or final grade as applicable. It is the responsibility of the student to reschedule the makeup with the instructor. The Instructor reserves the right to change the test format of any makeup. Instructors are not required to issue make-up work for an unexcused class absence. Instructor also reserves the right to give full or partial credit for any makeup work that is allowed and that resulted from an unexcused absence.

**Missed Quizzes:** Missed quizzes due to legitimate reasons should be rescheduled within one week of the scheduled quiz or a date assigned by the Instructor. It is the responsibility of the student to reschedule makeup quizzes. The Instructor reserves the right to change the test format of the makeup quiz. The instructor is not required to make up work for unexcused class absences. The instructor reserves the right to give full or partial credit for any makeup work that is allowed resulting from an unexcused absence.

**Attendance:** Attendance is based on the student missing no more than 10% out of the semester without a valid excuse. After the 10%, the instructor may withdraw the student at their discretion. Any student thirty or more minutes late will be counted absent. Students that leave before class is dismissed will be counted absent. The Instructor reserves the right to dock points for any missed class without a legitimate excuse.

**Missed Lab Exercises:** Students will have one day out of the semester assigned by the instructor to make up any lab exercises missed due to the student being absent for legitimate reasons. Instructors are not required to make up work for unexcused class absences. Instructors reserve the right to give full or partial credit for makeup work that is provided because of unexcused absences.

**Plagiarism:** Plagiarism shall be defined as appropriating, buying, receiving as a gift, or obtaining by any other means, another person's work and the unacknowledged submission or incorporation of it in one's own written work. All papers submitted to Canvas will be scanned with [turnitin.com](https://www.turnitin.com) and the instructor reserves the right to dock points based on the results.

**Cheating:** Cheating on a test shall include:

- a. Copying from another student's test
- b. Using test materials not authorized by the person administering the test
- c. Collaborating with or seeking aid from another student during a test without permission from the test administrator
- d. Knowingly using, buying, selling, stealing, or soliciting, in whole or part, the contents of an unadministered test.
- e. The unauthorized transporting or removal, in whole or in part, of the contents of the unadministered test.
- f. Substituting for another student, or permitting another student to substitute for one's self, to take a test.
- g. Bribing another person to obtain an unadministered test or information about an unadministered test.
- h. If a student is observed cheating they will be sent home immediately counted absent and given a zero on the assignment they were cheating on.

**Safety:** All students are required in lab exercises to bring and wear the proper PPE as instructed by their instructor. Failure to do so will result in one warning; if a student continues to violate safety rules the student will be sent home and counted absent.

**Class Conduct:** All cell phones should be turned off in all classes. If you must receive a call notify your instructor and step out of the classroom. No cell phones are allowed during testing. No disruptive behavior is allowed in class; if a student is being disruptive as determined by the instructor one warning will be given. If the behavior persists, the student will be sent home and counted absent.

Students will be dropped after the 12th class day if they have not completed any assignments.

**Some mandatory meetings outside of class days and times may be required to attend for credit. Valid excuses must be submitted with proof via email to your professor to avoid grade penalties.**

## Course Grade

The grading scale for this course is as follows:

Category Percentage:

Exams = 40%

Quizzes = 30%

Lab Exercises = 20%

Attendance = 10%

## Texts Materials, and Supplies

- ***Industrial Maintenance 2nd Edition Michael E. Brumbach ISBN-13: 978-1133131199***
- **Notepad**
  - Hard hat
  - Safety glasses
  - Gloves
  - Closed-toed boots or shoes

## Required Readings

***Industrial Maintenance 2nd Edition Michael E. Brumbach ISBN-13: 978-1133131199***

## Other

- Courses conducted via video conferencing may be recorded and shared for instructional purposes by the instructor.
- For current texts and materials, use the following link to access bookstore listings: <https://www.panolacollegestore.com>.
- For testing services, use the following link: <https://www.panola.edu/student-services/student-support/academic-testing-center>.
- 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 Charles C. Matthews Student Center or go to <https://www.panola.edu/student-services/student-support/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: <https://www.panola.edu/> (located on at the bottom under student)

## 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 timeline 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 databases 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.