MNT-110, Intro to Maintenance Procedures

Orientation and Introduction

Introduction

Concept Content:

In this section you will give an introduction of yourself to your class. This is an opportunity to state your relevant experiences and credentials to teach this subject along with your personal background. This can help connecting with students. You can make a video introduction and upload it to this page as well.

Also, this is where you will give a brief overview of the course and what it's contents will be. There is a section later on in this module where you will give more detail about the course.

Course Syllabus

Concept Goals:

Insert the student learning outcomes for the course here.

Concept Content:

This is where you will upload the syllabus. You can do this either by uploading the syllabus text here or you can upload a copy of the syllabus under the resources tab for this section. If you do upload it to the resources, please be sure to give instructions to your students to look for the syllabus there.

Course Resources

Concept Goals:

You can leave this section blank provided you uploaded the student learning outcomes to the previous section.

Concept Content:

This is where you would outline student support resources such as tutoring services, listing your office ours, contact info for support for your college's learning management system, etc. If there are documents you wish to upload, be sure to upload them to the resources tab and give instructions for the students to find the documents there.

Course Overview

Concept Goals:

Course Learning Objectives

1.) Able to describe basic automated machine operation, operator safety fundamentals, and component adjustment procedures.

2.) Demonstrates troubleshooting and preventative maintenance procedures on basic mechanical systems.

3.) Able to Describe various components of industrial motor controls, including overload protection, transformers, relays, and input devices.

4.) Identify types of key fasteners.

5.) Demonstrate and apply proper safety procedures for energized and de-energized equipment while using proper PPE.

6.) Able to Describe various components of pneumatic systems including; overload protection, control valves, and hydraulic actuators.

Concept Content:

This course covers basic maintenance fundamentals for power transmission equipment. Topics include equipment inspection, lubrication, alignment, and other scheduled maintenance procedures. Upon completion, students should be able to demonstrate knowledge of accepted maintenance procedures and practices according to current industry standards.

Module	Module Learning Objectives

Module 1 - Industrial Safety and OSHA	• List different types of PPE and discuss their functions accurately (SLO 1) • Describe the process of Lockout/Tagout procedures (SLO 5) • Define common electrical terms (SLO 1) • List the components of and describe 6S methodology (SLO 1) • Identify shop hazards (SLO 1)
Module 2 - Maintenance Principles, Recordkeeping, and Maintenance Tools	• Describe the differences between reactive vs proactive maintenance (SLO 2) • Describe how thermal, vibration, oil, ultrasound, and motor-current analysis work (SLO 2) • Correctly read a maintenance work order (SLO 2) • Idenfity common hand tools (SLO 2) • Describe safety precautions with hand tools (SLO 1) • Understand what RPM to set for a saw based on the material used (SLO 2) •
Module 3 - Print Reading	• Draw an accurate mulitiview drawing of an object (SLO 3) • Define basic lines on a blueprint (SLO 3) • Recognize basic lines on a pneumatic diagram (SLO 6)
Module 4 - Fasteners	• Correctly identify the parts of a thread (SLO 4) • Understand how different fasteners work (SLO 4) • Describe how to correctly fasten different nuts and bolts (SLO 4)
Module 5 - Mechanical Rigging/Installation	• Demonstrate the ability to inspect equipment and record any issues correctly (SLO 2) • Describe the differences between ropes, chains, and wires and what situations you would use them in (SLO 2) • Recognize and discuss the different types of rigging hardware such as eyebolts, hooks, and shackles, and their purpose. (SLO 2)
Week 6 - Power Transmission Principles	• Describe the basic operations of simple machines (SLO 1, 3) • Understand how to calculate torque (SLO 1, 2) • Create a preventative maintenance schedule (SLO 2)
Week 7 - Mid-Term Exam	• Demonstrate understanding of course material
Week 8 - Bearings, Seals, and Lubrication	• Describe the differences between types of bearings (SLO 3) • Describe the process of lubricating bearings (SLO 3) • Research a bearing and write out how to work with a specific bearing (SLO 3)
Week 9 - Shafts, Couplings, and Alignment	• Complete a pre-alignment checklist for a machine (SLO 1, 2) • Describe how a universal joint works (SLO 1) • Describe the differences between types of shafts (SLO 3)

Week 10 - Belts and Pulleys, Chains and Sprockets, Gears and Gearboxes	• Identify types of belts, gears, and chains (SLO 3) • Describe the steps involved with installing sheaves and adjusting them (SLO 3) • Understand proper lubrication methods for chains (SLO 3)
Week 11 - Mechanical Systems Troubleshooting	• Describe how the bathtub curve works (SLO 2) • Define and describe properties of metal such as ductility, hardness, etc. (SLO 3) • Understand how vibration analysis monitoring works (SLO 2) • Create a maintenance procedure (SLO 2)
Week 12 - Pneumatic Systems	• Correctly identify functions of pneumatic valves (SLO 6) • Correctly perform lockout/tagout on a pneumatic system (SLO 5) • Describe the parts of a pneumatic system (SLO 6)
Week 13 - Pneumatic Systems Pt. 2	• Identify parts of a pneumatic diagram (SLO 6) • Describe how electricity works with fluid power (SLO 6) • Use a digital multimeter accurately (SLO 2)
Week 14 - Hydraulic Systems	• Recognize and label the parts of a hydraulic system (SLO 6) • Describe the process of inspect an hydraulic cylinder (SLO 6) • Describe the process of cleaning a hydraulic system (SLO 6)
Week 15 - Final Exam	• Demonstrate understanding of course material

Instructor Note: This is a 15 week course. If you need a 16th week due to your semesters being 16 weeks, you may have to create a 16th week.

Notes/Helpful Tips

Next Steps...

Your Census assignments are REQUIRED in order to remain in the class and they MUST be completed prior to the Census Date **[insert census date here]**. **If you do not have a census date requirement, you can delete this section.**

Effective note taking is also important for not only this course, but for your career as well. Note taking is a great way to retain information. The process of taking notes can keep you alert and focused on the information being presented. It also keeps your mind engaged with what you are hearing, increasing the likelihood you will retain that information. Note taking can also allow you to better organize your thoughts on the information being discussed.

Here is a video that provides some tips for effective note taking.

Module 1

1.1 Module Overview

Concept Goals:

By the end of this module, you will:

- List different types of PPE and discuss their functions accurately (SLO 1)
- Describe the process of Lockout/Tagout procedures (SLO 5)
- Define common electrical terms (SLO 1)
- List the components of and describe 6S methodology (SLO 1)
- Identify shop hazards (SLO 1)

Concept Content:

Welcome to MNT 110. This week we will start with safety. See module 1.2 for more detail.

This Week at a Glance:

Reading:

Industrial Safety and OSHA Lecture - 26 Slides

Electrical Safety - 27 Slides

Videos:

OSHA Training Tutorial – Understanding Safety Data Sheets – 19.5 Minutes

Lockout Tagout – An Introduction to the Control of Hazardous Energy – 3.5 Minutes

Lockout Tagout – Affected Employees – 5 Minutes

Pinch Points – 2.5 Minutes

PPE Safety Video Testing Common Types of PPE – 4 Minutes

6S Methodology, 5S + Safety – 7 Minutes

Assignments:

Lockout/Tagout Demonstration

Workplace Hazard Identification Worksheet

Module 1 Quiz -12 Questions

1.2 Module Content Resources

Concept Content:

For our week on safety, we will discuss OSHA standards and go over basics of industrial safety. This will include discussing Safety Data Sheets, Electrical Hazards, Lockout/Tagout, 6S Methodology and much more. The reason we start with this is because any manufacturing facility has hazards. It is important to recognize these hazards so that you do not needlessly put yourself at risk. For example, In 2019 alone, the manufacturing industry reported 846,700 injuries, which represents 6.6 cases per 100 full-time workers.

Reading:

Industrial Safety and OSHA Lecture - 26 Slides - **(Instructor Notes: Many of the lecture powerpoints go along with Industrial Maintenance and Mechatronics by Shawn A. Ballee and Gary R. Shearer from Goodheart Wilcox. This textbook is a great resource for your students.)**

Electrical Safety - 27 Slides

Videos: These are good videos to expand/reinforce the topics from the lecture.

OSHA Training Tutorial – Understanding Safety Data Sheets – 19.5 Minutes

Lockout Tagout – An Introduction to the Control of Hazardous Energy – 3.5 Minutes

Lockout Tagout – Affected Employees – 5 Minutes – This video shows what to do for LO/TO if you are

an affected employee and not the one doing maintenance.

Pinch Points – 2.5 Minutes

PPE Safety Video Testing Common Types of PPE – 4 Minutes - This is a great demonstration as to what PPE does to protect you from injuries.

6S Methodology, 5S + Safety – 7 Minutes

1.3 Module Assessment/Assignment

Concept Content:

Assignments:

Lockout/Tagout Demonstration - In class we will demonstrate how lockout/tagout works on our equipment **(Instructor Note: If you do not have equipment with which you can demonstrate on, delete this assignment)**

Workplace Hazard Identification Worksheet - Download the image and identify the safety violations in a word document and upload under assignments. Look under quizzes at question one. **(Instructor Note: the answer key is located under the instructor resources tab)**

Module 1 Quiz -12 Questions

1.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

1.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested

in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

1.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- List different types of PPE and discuss their functions accurately (SLO 1)
- Describe the process of Lockout/Tagout procedures (SLO 5)
- Define common electrical terms (SLO 1)
- List the components of and describe 6S methodology (SLO 1)
- Identify shop hazards (SLO 1)

Concept Content:

This first week of MNT 110, we discussed safety. This included an overview of OSHA and electrical safety. Next week we will start talking about maintenance principles.

This Week at a Glance:

Reading:

Industrial Safety and OSHA Lecture - 26 Slides

Electrical Safety - 27 Slides

Videos:

OSHA Training Tutorial – Understanding Safety Data Sheets – 19.5 Minutes

Lockout Tagout – An Introduction to the Control of Hazardous Energy – 3.5 Minutes

Lockout Tagout – Affected Employees – 5 Minutes

Pinch Points – 2.5 Minutes

PPE Safety Video Testing Common Types of PPE – 4 Minutes

6S Methodology, 5S + Safety – 7 Minutes

Assignments:

Lockout/Tagout Demonstration

Workplace Hazard Identification Worksheet

Module 1 Quiz -12 Questions

Module 2

2.1 Module Overview

Concept Goals:

By the end of this module, you should:

- Describe the differences between reactive vs proactive maintenance (SLO 2)
- Describe how thermal, vibration, oil, ultrasound, and motor-current analysis work (SLO 2)
- Correctly read a maintenance work order (SLO 2)

Concept Content:

This week we will discuss maintenance principles and recordkeeping. See module 2.2 for more details.

This Week At A Glance:

Lectures:

Maintenance Principles and Recordkeeping - 19 Slides

Maintenance Tools - 40 Slides

Videos:

Reactive vs Proactive Maintenance - 7 Minutes

The Reason for Condition Monitoring - 25 Minutes

Why Vibration Analysis - 7 Minutes

What is a Vibration Sensor - 8 Minutes

Hand Tool Safety - 6 Minutes

Types of Screwdrivers - 3.5 Minutes

Introduction to Hand Tools: Wrenches - 7 Minutes

How to Choose and Use Pliers - 4.5 Minutes

Reading:

What is Ultrasound Analysis? - Webpage

What is ultrasound analysis (UA)?. onupkeep. (n.d.).
https://upkeep.com/learning/ultrasound-analysis/

What is Oil Analysis for Predictive Maintenance - Webpage

What is oil analysis for predictive maintenance?: ATS. Advanced Technology Services. (n.d.).
https://www.advancedtech.com/blog/lubricating-oil-analysis/

Thermal Imaging - Webpage

Universe Optics. (2024, January 29). *Thermal imaging: Custom lens design*.
https://www.universeoptics.com/thermal-imaging-for-preventative-maintenance/

How to Write a Work Order Letter - Webpage

How to write A work order letter. onupkeep. (n.d.-a).
https://upkeep.com/learning/write-a-work-order-letter/

12 Tips for Drilling Holes in Metal - Webpage

Best RPM for Hole Saws When Cutting Any Material - Webpage

Assignments:

Module 2 Quiz - 28 Questions

Preventative Maintenance Assignment

Hand Tool Matching Assignment

2.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will talk about maintenance principles and go over record keeping. It is important to know why we do maintenance and the various ways we can do proactive maintenance. This is done so that we can keep problems from getting worse.

Lectures:

Maintenance Principles and Recordkeeping - 19 Slides

Maintenance Tools - 40 Slides

Videos: These videos provide visual elements to go with what we discussed in the lecture.

Reactive vs Proactive Maintenance - 7 Minutes

The Reason for Condition Monitoring - 25 Minutes

Why Vibration Analysis - 7 Minutes

What is a Vibration Sensor - 8 Minutes

Hand Tool Safety - 6 Minutes

Types of Screwdrivers - 3.5 Minutes

Introduction to Hand Tools: Wrenches - 7 Minutes

How to Choose and Use Pliers - 4.5 Minutes

Reading: These articles help expand upon some of the topics discussed in the lecture.

What is Ultrasound Analysis? - Webpage

What is ultrasound analysis (UA)?. onupkeep. (n.d.). https://upkeep.com/learning/ultrasound-analysis/

What is Oil Analysis for Predictive Maintenance - Webpage

What is oil analysis for predictive maintenance?: ATS. Advanced Technology Services. (n.d.). https://www.advancedtech.com/blog/lubricating-oil-analysis/

Thermal Imaging - Webpage

Universe Optics. (2024, January 29). *Thermal imaging: Custom lens design*. https://www.universeoptics.com/thermal-imaging-for-preventative-maintenance/

How to Write a Work Order Letter - Webpage

How to write A work order letter. onupkeep. (n.d.-a). https://upkeep.com/learning/write-a-work-order-letter/

12 Tips for Drilling Holes in Metal - Webpage

Best RPM for Hole Saws When Cutting Any Material - Webpage

2.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week's assignments:

Module 2 Quiz - 28 Questions

Preventative Maintenance Assignment - Get in a group of two. Each group will be assigned a piece of equipment to create a daily, weekly, monthly, semi-annual, or annual PM that includes step by step instructions and also pictures that contain arrows etc. Once the groups are assigned their piece of equipment, you must use the internet to find the information required to complete this assignment. Upload your completed assignment under the assignments tab. The first question under quiz will have a link for you tu upload your assignment to. **(Instructor note: there is a rubric for this assignment in the instructor resource section).**

Hand Tool Matching Assignment - Located in the assignments tab under assignments.

2.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

2.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

2.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Describe the differences between reactive vs proactive maintenance (SLO 2)
- Describe how thermal, vibration, oil, ultrasound, and motor-current analysis work (SLO 2)
- Correctly read a maintenance work order (SLO 2)

Concept Content:

This week we discussed maintenance principles and recordkeeping. As you can see, there is a lot to consider when it comes to what type of maintenance is needed and how that maintenance is carried out. Next week we will discuss maintenance tools.

This Week In Review:

Lectures:

Maintenance Principles and Recordkeeping - 19 Slides

Maintenance Tools - 40 Slides

Videos:

Reactive vs Proactive Maintenance - 7 Minutes

The Reason for Condition Monitoring - 25 Minutes

Why Vibration Analysis - 7 Minutes

What is a Vibration Sensor - 8 Minutes

Hand Tool Safety - 6 Minutes

Types of Screwdrivers - 3.5 Minutes

Introduction to Hand Tools: Wrenches - 7 Minutes

How to Choose and Use Pliers - 4.5 Minutes

Reading:

What is Ultrasound Analysis? - Webpage

What is ultrasound analysis (UA)?. onupkeep. (n.d.).
https://upkeep.com/learning/ultrasound-analysis/

What is Oil Analysis for Predictive Maintenance - Webpage

What is oil analysis for predictive maintenance?: ATS. Advanced Technology Services. (n.d.).
https://www.advancedtech.com/blog/lubricating-oil-analysis/

Thermal Imaging - Webpage

Universe Optics. (2024, January 29). *Thermal imaging: Custom lens design*.
https://www.universeoptics.com/thermal-imaging-for-preventative-maintenance/

How to Write a Work Order Letter - Webpage

How to write A work order letter. onupkeep. (n.d.-a).
https://upkeep.com/learning/write-a-work-order-letter/

12 Tips for Drilling Holes in Metal - Webpage

Best RPM for Hole Saws When Cutting Any Material - Webpage

Assignments:

Module 2 Quiz - 28 Questions

Preventative Maintenance Assignment

Hand Tool Matching Assignment

Module 3

3.1 Module Overview

Concept Goals:

By the end of this module, you should:

- Draw an accurate mulitiview drawing of an object (SLO 3)
- Define basic lines on a blueprint (SLO 3)
- Recognize basic lines on a pneumatic diagram (SLO 6)

Concept Content:

This week we will look into print reading. See module 3.2 for more detail.

This Week At a Glance:

Lecture:

Print Reading - 40 Slides

Videos:

Basic Blueprint Reading Parts of a Print - Pt 1 - 8.5 Minutes

Basic Blueprint Reading Parts of a Print - Pt 2 - 10.5 Minutes

How to Read Electrical Diagrams - 11 Minutes

Reading:

Graphic Symbols for Fluid Power Diagrams - Webpage.

Assignments:

Module Quiz - 8 Questions

Object Views Project

3.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will talk about print reading. In order to perform proper maintenance, one has to be able to read schematics in order to know how to work with and repair them.

Lecture:

Print Reading - 40 Slides

Videos: these will help give visual examples of some of the concepts covered in the lecture.

Basic Blueprint Reading Parts of a Print - Pt 1 - 8.5 Minutes

Basic Blueprint Reading Parts of a Print - Pt 2 - 10.5 Minutes

How to Read Electrical Diagrams - 11 Minutes

Reading:

Graphic Symbols for Fluid Power Diagrams - Webpage. This is a great recourse for fluid power symbols as it has pulled in resources from the U.S. Navy's training course on the subject.

3.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week's assignments:

Module 3 Quiz - 8 Questions - Located under the assignments tab under quiz.

Views Project Assignment - Download the worksheet. We will complete this project in class after our lecture which will cover different types of views in drawings.

3.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

3.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

3.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Draw an accurate mulitiview drawing of an object (SLO 3)
- Define basic lines on a blueprint (SLO 3)
- Recognize basic lines on a pneumatic diagram (SLO 6)

Concept Content:

This week we spoke about print reading. Next week we will talk about fasteners.

This Week At a Glance:

Lecture:

Print Reading - 40 Slides

Videos:

Basic Blueprint Reading Parts of a Print - Pt 1 - 8.5 Minutes

Basic Blueprint Reading Parts of a Print - Pt 2 - 10.5 Minutes

How to Read Electrical Diagrams - 11 Minutes

Reading:

Graphic Symbols for Fluid Power Diagrams - Webpage.

Assignments:

Module Quiz - 8 Questions

Object Views Project

Module 4

4.1 Moudle Overview

Concept Goals:

By the end of this module, you should:

- Correctly identify the parts of a thread (SLO 4)
- Understand how different fasteners work (SLO 4)

- Describe how to correctly fasten different nuts and bolts (SLO 4)

Concept Content:

This week we will talk about fasteners and how to work with them. See module 4.2 for more detail.

This Week At A Glance:

Lecture:

Fasteners - 46 Slides

Videos:

Fastener Identification Guide - 13 Minutes

How It's Made Nuts and Bolts - 4.5 Minutes

Thread Anatomy - 4 Minutes

Reading:

Guide for Fastening Nuts and Bolts - Webpage

Mothersbaugh, A. (2024, March 4). *Guide for fastening nuts & bolts*. Construction Fasteners & Tools. https://cf-t.com/blog/simple-guide-for-fastening-nuts-and-bolts

Assignments:

Thread Fastener Part Identification Assignment

Module 4 Quiz - 10 Questions

Maintenance Procedure for Greenlee Hydraulic Pump

4.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will discuss fasteners. We will discuss the types of fasteners and how they are used. Fasteners are commonly used to join machine parts and the building blocks of machines together.

This Week's Material:

Lecture:

Fasteners - 46 Slides

Videos:

Fastener Identification Guide - 13 Minutes

How It's Made Nuts and Bolts - 4.5 Minutes

Thread Anatomy - 4 Minutes

Reading:

Guide for Fastening Nuts and Bolts - Webpage

Mothersbaugh, A. (2024, March 4). *Guide for fastening nuts & bolts*. Construction Fasteners & Tools. https://cf-t.com/blog/simple-guide-for-fastening-nuts-and-bolts

4.3 Moudle Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Thread Fastener Part Identification Assignment

Module 4 Quiz - 10 Questions

Maintenance Procedure for Greenlee Hydraulic Pump - Write a weekly maintenance procedure for a Greenlee hydraulic pump. You can use the internet to look up information related to this machine.

Write out your procedure and upload the completed document to the assignments tab. Under quiz, the first question is where you can upload your file.

4.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

4.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

4.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Correctly identify the parts of a thread (SLO 4)
- Understand how different fasteners work (SLO 4)
- Describe how to correctly fasten different nuts and bolts (SLO 4)

Concept Content:

This week we discussed fasteners. Next week we will discuss print reading and mechanical rigging.

This Week In Review:

Lecture:

Fasteners - 46 Slides

Videos:

Fastener Identification Guide - 13 Minutes

How It's Made Nuts and Bolts - 4.5 Minutes

Thread Anatomy - 4 Minutes

Reading:

Guide for Fastening Nuts and Bolts - Webpage

Mothersbaugh, A. (2024, March 4). *Guide for fastening nuts & bolts*. Construction Fasteners & Tools. https://cf-t.com/blog/simple-guide-for-fastening-nuts-and-bolts

Assignments:

Thread Fastener Part Identification Assignment

Module 4 Quiz - 10 Questions

Maintenance Procedure for Greenlee Hydraulic Pump

Module 5

5.1 Module Overview

Concept Goals:

By the end of this week, you will:

- Demonstrate the ability to inspect equipment and record any issues correctly (SLO 2)
- Describe the differences between ropes, chains, and wires and what situations you would use them in (SLO 2)
- Recognize and discuss the different types of rigging hardware such as eyebolts, hooks, and shackles, and their purpose. (SLO 2)

Concept Content:

This week we will discuss mechanical rigging and installation procedures. See module 5.2 for more

detail.

This Week At A Glance:

Lectures

Rigging and Mechanical installations - 60 Slides

Videos:

Safety in Lifting - Sling Inspections - 6.5 Minutes

How to Calculate & Determine the Weight of a Load for Overhead Lifts - 9 Minutes

Lifting Slings 101: Choosing the Right Lifting Sling for Your Job - 8 Minutes

Assignments:

Module 5 Quiz - 10 Questions

Equipment Inspection Lab

5.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will discuss rigging and mechanical installations. Oftentimes, in industry, you will be working with large and heavy equipment and pieces of equipment. It will be important to know how to properly rig these parts for moving. Improperly rigged parts can lead to accidents that damage pieces and cause injuries to workers nearby.

Lectures:

Rigging and Mechanical installations - 60 Slides

Videos:

Safety in Lifting - Sling Inspections - 6.5 Minutes

How to Calculate & Determine the Weight of a Load for Overhead Lifts - 9 Minutes

Lifting Slings 101: Choosing the Right Lifting Sling for Your Job - 8 Minutes

5.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week's assignments:

Module 5 Quiz - 10 Questions

Equipment Inspection Lab

5.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

5.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

5.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Demonstrate the ability to inspect equipment and record any issues correctly (SLO 2)
- Describe the differences between ropes, chains, and wires and what situations you would use them in (SLO 2)
- Recognize and discuss the different types of rigging hardware such as eyebolts, hooks, and shackles, and their purpose. (SLO 2)

Concept Content:

This week we will discuss mechanical rigging and installation procedures. Next week we will look into power transmission principles.

This Week In Review:

Lectures

Rigging and Mechanical installations - 60 Slides

Videos:

Safety in Lifting - Sling Inspections - 6.5 Minutes

How to Calculate & Determine the Weight of a Load for Overhead Lifts - 9 Minutes

Lifting Slings 101: Choosing the Right Lifting Sling for Your Job - 8 Minutes

Assignments:

Module 5 Quiz - 8 Questions

Equipment Inspection Lab

Module 6

6.1 Module Overview

Concept Goals:

By the end of this module, you should:

- Describe the basic operations of simple machines (SLO 1, 3)
- Understand how to calculate torque (SLO 1, 2)
- Create a preventative maintenance schedule (SLO 2)

Concept Content:

This week we will discuss mechanical power transmission. See module 6.2 for more detail.

This Week At a Glance:

Lectures:

Mechanical Power Transmission - 35 Slides

Videos:

Simple Machines: The Lever - 6 Minutes

Simple Machines: The Pulley - 6.5 Minutes

Simple Machines: The Wheel & Axle - 6 Minutes

Simple Machines: The Inclined Plane - 6 Minutes

Simple Machines: The Wedge - 7 Minutes

Simple Machines: The Screw - 1.5 Minutes

Webpages:

Introduction to Mechanical Advantage - Khan Academy

Assignments:

Module 6 Quiz - 10 Questions

Preventative Maintenance Schedule Assignment - Vertical Mill

Preventative Maintenance Schedule Assignment - Lathe

6.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will discuss mechanical power transmission. The machines we work with are often a combo of simple machines. It is important to know how these machines interact with each other in order to understand how the machines work. We will also discuss how to calculate various forces and energy that work in machines.

This Week's Material:

Lectures:

Mechanical Power Transmission - 35 Slides

Videos: These videos expand upon the simple machines discussed in the lecture.

Simple Machines: The Lever - 6 Minutes

Simple Machines: The Pulley - 6.5 Minutes

Simple Machines: The Wheel & Axle - 6 Minutes

Simple Machines: The Inclined Plane - 6 Minutes

Simple Machines: The Wedge - 7 Minutes

Simple Machines: The Screw - 1.5 Minutes

Webpages:

Introduction to Mechanical Advantage - Khan Academy - this gives more detail into how to calculate mechanical advantage.

6.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module 6 Quiz - 10 Questions

Preventative Maintenance Schedule Assignment - Vertical Mill - Download the manual it. You will then write a preventative maintenance schedule for the vertical mill and upload it to the assignments tab. Go to quiz and look at question 1. That is where you will upload your file.

Preventative Maintenance Schedule Assignment - Lathe - Download the manual it. You will then write a preventative maintenance schedule for the vertical mill and upload it to the assignments tab. Go to quiz and look at question 2. That is where you will upload your file.

6.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

6.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

6.6 Module Wrap-Up

Concept Goals:

By the end of this module, you should:

- Describe the basic operations of simple machines (SLO 1, 3)
- Understand how to calculate torque (SLO 1, 2)
- Create a preventative maintenance schedule (SLO 2)

Concept Content:

This week we discussed mechanical power transmission. Next week is our mid-term exam.

This Week In Review:

Lectures:

Mechanical Power Transmission - 35 Slides

Videos:

Simple Machines: The Lever - 6 Minutes

Simple Machines: The Pulley - 6.5 Minutes

Simple Machines: The Wheel & Axle - 6 Minutes

Simple Machines: The Inclined Plane - 6 Minutes

Simple Machines: The Wedge - 7 Minutes

Simple Machines: The Screw - 1.5 Minutes

Webpages:

Introduction to Mechanical Advantage - Khan Academy

Assignments:

Module 6 Quiz - 10 Questions

Preventative Maintenance Schedule Assignment - Vertical Mill

Module 7

7.1 Module Overview

Concept Goals:

Module Learning Objective:

- Demonstrate understanding of course material.

Concept Content:

This week we will have our mid-term exam. To access it, click on the assignments tab and look under test.

The exam has 37 questions.

(Instructor note: this is a bank of questions for you to use, you can choose to use less than the 37 if you'd like by click on the live button to turn it off for student view. You are also free to add questions to the exam as well).

7.2 Module Wrap-Up

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

You have completed the mid-term exam. Congratulations! Next week we start the second half of the semester.

Module 8

8.1 Module Overview

Concept Goals:

By the end of this module, you will:

- Describe the differences between types of bearings (SLO 3)

- Describe the process of lubricating bearings (SLO 3)
- Research a bearing and write out how to work with a specific bearing (SLO 3)

Concept Content:

This week we will look at bearings, seals, and lubrication. See module 8.2 for more detail.

This Week At A Glance:

Lecture:

Bearings, Seals, and Lubrication - 55 Pages

Videos:

What is Bearing? Types of Bearings? How do they Work? - 10 Minutes

Bearing Selection Criteria - 8.5 Minutes

What are the Differences Between Grease and Oil - 8 Minutes

Reading:

Bearing Lubrication - Webpage

Bearing Installation and Removal Basics - Webpage

Assignments:

Module 8 Quiz - 10 Questions

Bearings Assignment

8.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will look into bearings, seals, and lubrication. Oftentimes, issues with the equipment technicians repair involve issues with one of these three things.

This Week's Material:

Lecture:

Bearings, Seals, and Lubrication - 55 Pages

Videos:

What is Bearing? Types of Bearings? How do they Work? - 10 Minutes

Bearing Selection Criteria - 8.5 Minutes

What are the Differences Between Grease and Oil - 8 Minutes

Reading:

Bearing Lubrication - Webpage

Payne, D. (2021, September 15). *Bearing lubrication tips & mistakes you might be making*. Bearing Supplier. https://www.bdsbearing.com/blog/bearing-lubrication

Bearing Installation and Removal Basics - Webpage

Knotek, R. (2017, November 9). *Bearing installation and removal basics*. Processing Magazine. https://www.processingmagazine.com/pumps-motors-drives/bearings-seals/article/15587270/bearing-installation-and-removal-basics

8.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module 8 Quiz -10 Questions (not including the bearings assignment submission)

Bearings Assignment - You will be assigned a type of bearing to research online. Look up the bearing and research all of the maintenance and lubrication procedures you must follow when using them. Write two paragraphs about what you find and upload them to the assignments section. It will be the first question under quiz.

8.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

8.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

8.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Describe the differences between types of bearings (SLO 3)
- Describe the process of lubricating bearings (SLO 3)
- Research a bearing and write out how to work with a specific bearing (SLO 3)

Concept Content:

This week took a look at bearings, seals, and lubrication. Next week we will look at shafts and couplings and how to align them.

In Review:

Lecture:

Bearings, Seals, and Lubrication - 55 Pages

Videos:

What is Bearing? Types of Bearings? How do they Work? - 10 Minutes

Bearing Selection Criteria - 8.5 Minutes

What are the Differences Between Grease and Oil - 8 Minutes

Reading:

Bearing Lubrication - Webpage

Bearing Installation and Removal Basics - Webpage

Assignments:

Module 8 Quiz - 10 Questions

Bearings Assignment

Module 9

9.1 Module Overview

Concept Goals:

By the end of this week, you will:

- Complete a pre-alignment checklist for a machine (SLO 1, 2)
- Describe how a universal joint works (SLO 1)
- Describe the differences between types of shafts (SLO 3)

Concept Content:

This week we will look over shafts, couplings, and alignment. See module 9.2 for more detail.

This Week's Material:

Lecture:

Shafts, Couplings, and Alignment - 52 Sides

Videos:

Shaft Alignment Training: Pre-Alignment Steps - 5 Minutes

Pillow Block Bearings - 1.5 Minutes

Replacing Pillow Block Bearings - 1 Minute

Universal Joint Mechanism - 1.5 Minutes

What is a Flexible Coupling - 2 Minutes

Types of Shaft Coupling, Animation, Machine Design - 10.5 Minutes

Dail Indicator Concepts: Correcting for Bar (Rod) Sag - 2.5 Minutes

Reading:

Four steps for improving pre-alignment machine maintenance efficiency - Webpage

Rim and Face - Alignment Knowledge - Webpage

Assignments:

Module 9 Quiz -15 Questions

Pre-Alignment Checklist Assignment

9.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will talk about shafts, couplings, and alignment. It is important to understand how these parts work in order to repair them. Alignment is important because improper alignment practices will cause the machine to not work.

This Week's Material:

Lecture:

Shafts, Couplings, and Alignment - 52 Sides

Videos:

Shaft Alignment Training: Pre-Alignment Steps - 5 Minutes

Pillow Block Bearings - 1.5 Minutes

Replacing Pillow Block Bearings - 1 Minute

Universal Joint Mechanism - 1.5 Minutes

What is a Flexible Coupling - 2 Minutes

Types of Shaft Coupling, Animation, Machine Design - 10.5 Minutes

Dail Indicator Concepts: Correcting for Bar (Rod) Sag - 2.5 Minutes

Reading:

Four steps for improving pre-alignment machine maintenance efficiency - Webpage

Person. (2023, July 18). *Four steps for improving pre-alignment machine maintenance efficiency*. Plant Engineering. https://www.plantengineering.com/articles/four-steps-for-improving-pre-alignment-machine-maintenance-efficiency/

Rim and Face - Alignment Knowledge - Webpage

Rim and face. Alignment Knowledge. (2020, February 20). https://www.alignmentknowledge.com/rim-and-face/

9.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignment:

Module 9 Quiz - 15 Questions

Pre-Checklist Assignment - Download the checklist. In class, you will be assigned a piece of equipment to inspect. Pretend that you are preparing for maintenance of the machine and run through the checklist. Report any issues you find. Turn in your completed checklist in class.

9.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

9.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be

appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

9.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Complete a pre-alignment checklist for a machine (SLO 1, 2)
- Describe how a universal joint works (SLO 1)
- Describe the differences between types of shafts (SLO 3)

Concept Content:

This week we discussed shafts, couplings, and alignment. Next week we will go into Belts, Pulleys, and more.

This Week in Review:

Lecture:

Shafts, Couplings, and Alignment - 52 Sides

Videos:

Shaft Alignment Training: Pre-Alignment Steps - 5 Minutes

Pillow Block Bearings - 1.5 Minutes

Replacing Pillow Block Bearings - 1 Minute

Universal Joint Mechanism - 1.5 Minutes

What is a Flexible Coupling - 2 Minutes

Types of Shaft Coupling, Animation, Machine Design - 10.5 Minutes

Dail Indicator Concepts: Correcting for Bar (Rod) Sag - 2.5 Minutes

Reading:

Four steps for improving pre-alignment machine maintenance efficiency - Webpage

Rim and Face - Alignment Knowledge - Webpage

Assignments:

Module 9 Quiz -15 Questions

Pre-Alignment Checklist Assignment

Module 10

10.1 Module Overview

Concept Goals:

By the end of this week, you will:

- Identify types of belts, gears, and chains (SLO 3)
- Describe the steps involved with installing sheaves and adjusting them (SLO 3)
- Understand proper lubrication methods for chains (SLO 3)

Concept Content:

This week we will review pulleys, gears, and gearboxes. See module 10.2 for more detail.

This week's material:

Lecture:

Pulleys, Gears, and Gearboxes - 72 Slides

Videos:

Belt Drive - Types of Belt Drives - 6 Minutes

V Bents Basic Characteristics and Selection - 9 Minutes

Sheave Change/Adjustment - 1.5 Minutes

Sheave Installation and Alignment - 1.5 Minutes

Pulley Belt Calculations - 10 Minutes

Reading:

Chain Installation and Maintenance - 11 Pages

Chain Installation and Maintenance Manual from Renold Jeffery

Chain Troubleshooting Guide - 2 Pages

Chain Troubleshooting Manual from Reynold Jeffery

Assignments:

Module 10 Quiz - 13 Questions

Sheave Alignment Lab

Waterjet Cutter Preventative Maintenance Schedule Draft

10.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will discuss pulleys, gears, and gearboxes. These parts are vital for a functional machine. Knowing how they are supposed to work and what to look out for when maintaining them is important in order to do the job of a maintenance technical well.

This week's material:

Lecture:

Pulleys, Gears, and Gearboxes - 72 Slides

Videos:

Belt Drive - Types of Belt Drives - 6 Minutes

V Bents Basic Characteristics and Selection - 9 Minutes

Sheave Change/Adjustment - 1.5 Minutes

Sheave Installation and Alignment - 1.5 Minutes

Pulley Belt Calculations - 10 Minutes

Reading:

Chain Installation and Maintenance - 11 Pages

Chain Installation and Maintenance Manual from Renold Jeffery

Chain Troubleshooting Guide - 2 Pages

Chain Troubleshooting Manual from Reynold Jeffery

10.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module 10 Quiz - 13 Questions (not counting the first question which is a space for you to turn in your PM draft)

Sheave Alignment Lab - In class we will practice replacing a sheave on a piece of machinery in the lab. (instructor note: delete this assignment if your classroom/lab does not have any equipment that has sheaves students can practice with).

Waterjet Cutter Preventative Maintenance Schedule Draft - Select one of the water jet cutters from this website. You will research that product and draft a preventative maintenance schedule for it. Submit your draft under the assignments tab. Look under quiz for the first question.

10.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

10.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

10.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Identify types of belts, gears, and chains (SLO 3)
- Describe the steps involved with installing sheaves and adjusting them (SLO 3)
- Understand proper lubrication methods for chains (SLO 3)

Concept Content:

This week we reviewed pulleys, gears, and gearboxes.

This week in review:

Lecture:

Pulleys, Gears, and Gearboxes - 72 Slides

Videos:

Belt Drive - Types of Belt Drives - 6 Minutes

V Bents Basic Characteristics and Selection - 9 Minutes

Sheave Change/Adjustment - 1.5 Minutes

Sheave Installation and Alignment - 1.5 Minutes

Pulley Belt Calculations - 10 Minutes

Reading:

Chain Installation and Maintenance - 11 Pages

Chain Installation and Maintenance Manual from Renold Jeffery

Chain Troubleshooting Guide - 2 Pages

Chain Troubleshooting Manual from Reynold Jeffery

Assignments:

Module 10 Quiz - 13 Questions

Sheave Alignment Lab

Waterjet Cutter Preventative Maintenance Schedule Draft

Module 11

11.1 Module Overview

Concept Goals:

By the end of this week, you will:

- Describe how the bathtub curve works (SLO 2)
- Define and describe properties of metal such as ductility, hardness, etc. (SLO 3)
- Understand how vibration analysis monitoring works (SLO 2)
- Create a maintenance procedure (SLO 2)

Concept Content:

This week we will cover troubleshooting mechanical systems. See module 11.2 for more detail.

This Week's Material:

Lectures:

Mechanical Systems Troubleshooting - 27 Slides

Videos:

What is Preventative Maintenance - 4 Minutes

The Bathtub Curve - 5.5 Minutes

Stress Strain Curve Explained with Tensile Test - 4.5 Minutes

Material Properties 101 - 6 Minutes

Vibration Analysis & Condition Monitoring Basis - 1 Minute

How Maintenance Planning & Scheduling Works - 3.5 Minutes

Reading:

Everything You Need to Know About Maintenance Planning - Webpage

Cousineau, M., Goncalves, T., & Afara, J. (2023, October 24). *Everything you need to know about maintenance planning*. Fiix. https://fiixsoftware.com/blog/maintenance-planning-and-scheduling-best-practices/

Assignments:

Module Review Quiz -12 Questions

Maintenance Procedure Assignment - Week 1

11.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will look into troubleshooting mechanical systems. Topics will include preventative maintenance, bathtub and stress/strain curves, properties of materials, and how to plan and schedule maintenance. These are basic foundational knowledge when it comes to working maintenance and repairs on machines in the industry.

This Week's Material:

Lectures:

Mechanical Systems Troubleshooting - 27 Slides

Videos:

What is Preventative Maintenance - 4 Minutes

The Bathtub Curve - 5.5 Minutes

Stress Strain Curve Explained with Tensile Test - 4.5 Minutes

Material Properties 101 - 6 Minutes - This video goes metallurgical properties and even brings up two more that were not mentioned in the lecture slides.

Vibration Analysis & Condition Monitoring Basis - 1 Minute

How Maintenance Planning & Scheduling Works - 3.5 Minutes

Reading:

Everything You Need to Know About Maintenance Planning - Webpage

Cousineau, M., Goncalves, T., & Afara, J. (2023, October 24). *Everything you need to know about maintenance planning*. Fiix. https://fiixsoftware.com/blog/maintenance-planning-and-scheduling-best-practices/

11.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module Review Quiz -12 Questions

Maintenance Procedure Assignment - Week 1- Download the instructions linked here. You will select

one of the machines from the lab to work on. You will have this week and next week to complete the assignment.

11.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

11.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

11.6 Module Wrap-Up

Concept Goals:

Module Learning Objective:

- Describe how the bathtub curve works (SLO 2)
- Define and describe properties of metal such as ductility, hardness, etc. (SLO 3)
- Understand how vibration analysis monitoring works (SLO 2)
- Create a maintenance procedure (SLO 2)

Concept Content:

This week we covered troubleshooting mechanical systems. Next week we will cover pneumatic

systems.

This Week's Material:

Lectures:

Mechanical Systems Troubleshooting - 27 Slides

Videos:

What is Preventative Maintenance - 4 Minutes

The Bathtub Curve - 5.5 Minutes

Stress Strain Curve Explained with Tensile Test - 4.5 Minutes

Material Properties 101 - 6 Minutes

Vibration Analysis & Condition Monitoring Basis - 1 Minute

How Maitenance Planning & Scheduling Works - 3.5 Minutes

Reading:

Everything You Need to Know About Maintenance Planning - Webpage

Cousineau, M., Goncalves, T., & Afara, J. (2023, October 24). *Everything you need to know about maintenance planning*. Fiix. https://fiixsoftware.com/blog/maintenance-planning-and-scheduling-best-practices/

Assignments:

Module Review Quiz -12 Questions

Maintenance Procedure Assignment - Week 1

Module 12

12.1 Module Overview

Concept Goals:

By the end of this week, you should:

- Correctly identify functions of pneumatic valves (SLO 6)
- Correctly perform lockout/tagout on a pneumatic system (SLO 5)
- Describe the parts of a pneumatic system (SLO 6)

Concept Content:

This week we will cover pneumatics. See module 12.2 for more detail.

This Week at a Glance:

Lectures:

Pneumatic Systems - 47 Slides

Pneumatic Basics - 25 Slides

Pneumatic Valves - 8 Slides

Pneumatics Primary Air Treatment - 19 Slides

Videos:

LockOut/TagOut, Electrical & Pneumatic Systems - 2.5 Minutes

Explanation of Lab Air Systems - 2 Minutes

Types of Pneumatic Cylinders - 5 Minutes

How to Control the Speed of a Pneumatic Cylinder - 7 Minutes

Assignments:

Module 12 Quiz - 10 Questions

Maintenance Procedure Assignment - Week 2

12.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will discuss the basics of pneumatics. This will include basics of how systems are set up, how valves work, how air treatment works, and we will go over some safety with lockout/tagout procedures.

This Week's Material:

Lectures:

Pneumatic Systems - 47 Slides

Pneumatic Basics - 25 Slides

Pneumatic Valves - 8 Slides

Pneumatics Primary Air Treatment - 19 Slides

Videos:

LockOut/TagOut, Electrical & Pneumatic Systems - 2.5 Minutes

Explanation of Lab Air Systems - 2 Minutes

Types of Pneumatic Cylinders - 5 Minutes

How to Control the Speed of a Pneumatic Cylinder - 7 Minutes

12.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

Assignments:

Module 12 Quiz - 10 Questions

Maintenance Procedure Assignment - Week 2 - Here is the form from last week. This week you are to finish your maintenance procedure and upload the completed procedure. Look under the assignments tab and quiz. The first question will have a space for you to upload your completed project.

12.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

12.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

12.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Correctly identify functions of pneumatic valves (SLO 6)
- Correctly perform lockout/tagout on a pneumatic system (SLO 5)

- Describe the parts of a pneumatic system (SLO 6)

Concept Content:

This week we covered the basics of pneumatics. Next week we will go more in depth about fluid power.

This Week at a Glance:

Lectures:

Pneumatic Systems - 47 Slides

Pneumatic Basics - 25 Slides

Pneumatic Valves - 8 Slides

Pneumatics Primary Air Treatment - 19 Slides

Videos:

LockOut/TagOut, Electrical & Pneumatic Systems - 2.5 Minutes

Explanation of Lab Air Systems - 2 Minutes

Types of Pneumatic Cylinders - 5 Minutes

How to Control the Speed of a Pneumatic Cylinder - 7 Minutes

Assignments:

Module 12 Quiz - 10 Questions

Maintenance Procedure Assignment - Week 2

Module 13

13.1 Module Overview

Concept Goals:

By the end of this module, you should:

- Identify parts of a pneumatic diagram (SLO 6)
- Describe how electricity works with fluid power (SLO 6)
- Use a digital multimeter accurately (SLO 2)

Concept Content:

This week we will expand upon the concepts we covered last week. See module 13.2 for more detail.

This Week's Material:

Lectures:

Pneumatic & Hydraulics Concepts - 27 Slides

Electrical Basics for Fluid Power - 23 Slides

Videos:

Fluid Power, Fluid Motion and Fluid Mechanics - 4.5 Minutes

Single Stage vs Two Stage Reciprocating Air Compressor - 5 Minutes

Pneumatic Cylinder: How Does It Work - 3 Minutes

Reading:

How to Use a Digital Multimeter - Webpage

Assignments:

Module Review Quiz - 5 Questions

13.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will expand upon pneumatics. We will look into more concepts related to pneumatics and look into how the electrical basics for fluid power works. This will also include a look into the parts of a pneumatic cylinder.

This Week's Material:

Lectures:

Pneumatic & Hydraulics Concepts - 27 Slides

Electrical Basics for Fluid Power - 23 Slides

Videos:

Fluid Power, Fluid Motion and Fluid Mechanics - 4.5 Minutes

Single Stage vs Two Stage Reciprocating Air Compressor - 5 Minutes

Pneumatic Cylinder: How Does It Work - 3 Minutes

Reading:

How to Use a Digital Multimeter - Webpage

13.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module Review Quiz - 5 Questions

13.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

13.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

13.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Identify parts of a pneumatic diagram (SLO 6)
- Describe how electricity works with fluid power (SLO 6)
- Use a digital multimeter accurately (SLO 2)

Concept Content:

This week we expanded upon the concepts we covered last week. Next week we will look specifically into hydraulics.

This Week In Review:

Lectures:

Pneumatic & Hydraulics Concepts - 27 Slides

Electrical Basics for Fluid Power - 23 Slides

Videos:

Fluid Power, Fluid Motion and Fluid Mechanics - 4.5 Minutes

Single Stage vs Two Stage Reciprocating Air Compressor - 5 Minutes

Pneumatic Cylinder: How Does It Work - 3 Minutes

Reading:

How to Use a Digital Multimeter - Webpage

Assignments:

Module Review Quiz - 5 Questions

Module 14

14.1 Module Overview

Concept Goals:

By the end of this module, you should:

- Recognize and label the parts of a hydraulic system (SLO 6)
- Describe the process of inspect an hydraulic cylinder (SLO 6)
- Describe the process of cleaning a hydraulic system (SLO 6)

Concept Content:

This week we will discuss hydraulic systems. See module 14.2 for more detail.

This Week At A Glance:

Lectures:

Hydraulic Systems - 54 Slides

Hydraulic Valves - 23 Pages

Videos:

What is a Hydraulic Tank/Resivor - 4.5 Minutes

Different Types of Hydraulic Valves - 11.5 Minutes

Inspect a Hydraulic Cylinder - 3 Minutes

Hydraulic Motor Rebuild - 8 Minutes

Reading:

How to Clean a Hydraulic System - Webpage

How to clean a hydraulic Reservoir. Finishing Systems. (2023, December 22). https://www.finishingsystems.com/blog/how-to-clean-a-hydraulic-reservoir/

Assignments:

Module 14 Quiz- 12 Questions

Hydraulic Circuit Lab

14.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will discuss hydraulic systems. We will discuss the components of a system, how valves work, and how to clean and inspect hydraulic systems. There will also be a discussion on how to rebuild a hydraulic system.

This Week's Material:

Lectures:

Hydraulic Systems - 54 Slides

Hydraulic Valves - 23 Pages (instructor note: this lecture provides a much more in-depth explanation on hydraulic valves that the first lecture does)

Videos:

What is a Hydraulic Tank/Resivor - 4.5 Minutes

Different Types of Hydraulic Valves - 11.5 Minutes

Inspect a Hydraulic Cylinder - 3 Minutes

Hydraulic Motor Rebuild - 8 Minutes

Reading:

How to Clean a Hydraulic System - Webpage

How to clean a hydraulic Reservoir. Finishing Systems. (2023, December 22). https://www.finishingsystems.com/blog/how-to-clean-a-hydraulic-reservoir/

14.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module 14 Quiz - 12 Questions

Hydraulic Circuit Lab - Download the document. We will work on the experiment using the hydraulic set up in the lab. **(Instructor note: if you do not have a set up similar to the one pictured in the lab document, delete this assignment.)**

Verma, M., & Alavizadeh, A. (2017). Deign and Development of Pneumatic Lab Activities for a Course on Fluid Power. Washington DC; American Society for Engineering Education.

14.4 Module Reflection

Concept Content:

This is a completely optional section. The purpose of this section is to ask your students to reflect on the material they have learned in this course. Or, if there is a specific area of the content you wanted to make sure students understood, you could guide them to discuss that in their response to your reflection question(s). You could also use this section to discuss case studies related to the content this section went over. However, if you feel that this would not be an appropriate assignment/task for your specific subject, please feel free to delete this section from your class.

14.5 Module Discussion Board

Concept Content:

This is a completely optional section. The purpose of this section is to invite your students to discuss the week's content and what they learned from it with each other. If you feel this would not be appropriate for your class or at least this week's content, feel free to delete it. If you are interested in doing a discussion board, a good idea would be to come up with a question related to the week's content for the students to answer. From there, require them to answer the quesion and respond to a least one other student's answer to foster discussion.

14.6 Module Wrap-Up

Concept Goals:

Module Learning Objectives:

- Recognize and label the parts of a hydraulic system (SLO 6)
- Describe the process of inspect an hydraulic cylinder (SLO 6)
- Describe the process of cleaning a hydraulic system (SLO 6)

Concept Content:

This week we discussed hydraulic systems and gave an overview regarding their maintenance and repair. Next week will be our final exam for the course.

This Week In Review:

Lectures:

Hydraulic Systems - 54 Slides

Hydraulic Valves - 23 Pages (instructor note: this lecture provides a much more in-depth explanation

on hydraulic valves that the first lecture does)

Videos:

What is a Hydraulic Tank/Resivor - 4.5 Minutes

Different Types of Hydraulic Valves - 11.5 Minutes

Inspect a Hydraulic Cylinder - 3 Minutes

Hydraulic Motor Rebuild - 8 Minutes

Reading:

How to Clean a Hydraulic System - Webpage

How to clean a hydraulic Reservoir. Finishing Systems. (2023, December 22). https://www.finishingsystems.com/blog/how-to-clean-a-hydraulic-reservoir/

Assignments:

Module 14 Quiz- 12 Questions

Hydraulic Circuit Lab

Module 15 - Final Exam

15.1 Final Exam

Concept Goals:

By the end of this module, you will:

- Demonstrate understanding of course material

Concept Content:

Welcome to our final exam week. To access your exam, click on the assignments tab and look under test.

MNT-110 Final Exam - 55 Questions **(instructor Note: this is a bank of 55 questions, if you wish to use less, simply go into edit mode and click the live button setting to off. If you want to add questions of your own, you can do that as well).**

15.2 Course Wrap-Up

Concept Content:

You have now completed the final exam. With this, you have finished MNT-110. Best of luck going forward in your program path.

Faculty Resources (For Instructor Only, Do Not Publish Live)

Odigia Guide

Concept Content:

Click on the resources tab to find the guide sheet for instructors.

Hazard Identification Assignment Answer Key

Concept Content:

Hazard Identification Assignment Answer Key

Preventative Maintenance Schedule Rubric

Concept Content:

This link is for the grading rubic of the preventative maintenance schedules. This will help gude you on grading the student assginments from module 2.