ELC-128, Intro to PLC

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.) Understand ladder logic and its application as well as PLCs.

2.) Use and demonstrate programming software to develop, monitor, and troubleshoot PLC programs.

1. Demonstrate an understanding of PLC operation and programming principles.
2. Interface PLCs with various I/O devices.

3.) Design and interpret PLC programs. A. Demonstrate use of timer instructions, control instructions, and basic math instructions.

4.) Test and troubleshoot PLC components.

5.) Describe and operate control transformers, motor starters, and relays. Analyze and troubleshoot motor control circuits.

Concept Content:

This course introduces the programmable logic controller (PLC) and its associated applications. Topics include ladder logic diagrams, input/output modules, power supplies, surge protection, selection/installation of controllers, and interfacing of controllers with equipment. Upon completion, students should be able to understand basic PLC systems and create simple programs.

Module	**Module Learning Objectives**
Week 1: PLC Basics	
Week 2: PLC Architecture	
Week 3: Setting Up Communications with A PLC	• Describe how elements of ladder logic work (SLO 1) • Read a ladder logic diagram and input the logic accurately into a PLC (SLO 1, SLO 2)
Week: 4 Numbering Systems	• Compare and contrast basic number systems (SLO 1) • Convert decimals into their binary coded decimal representation (SLO 1)
Week 5: Basics of Logic	• Understand how different logic gates work (SLO 1) • Read a relay ladder diagram and change it into a ladder logic program (SLO 1, SLO 2, SLO 3) • Work with Boolean equations while creating PLC ladder programs (SLO 1, SLO 2, SLO 3)

Week 6	• Describe different types of PLC programming languages (SLO 1, SLO 2, SLO 3) • Describe parts of processor memory and memory space (SLO 1, SLO 2, SLO 3) • Understand the factors that play into scan time (SLO 1, SLO 2, SLO 3)
Week 7: Mid-Term Exam	• Demonstrate understanding of course material
Week 8: Basics of Programming Week 2	• Understand different programming modes (SLO 2) • Describe the shapes that represent inputs and outputs on a sketch (SLO 3) • Demonstrate ability to program simple machines and programs (SLO 3, SLO 4, SLO 5)
Week 9: PLC Monitor Control	• Understand the basics of PLC Motor Control (SLO 2) • Write a basic PLC program (SLO 3, SLO 4, SLO 5)
Week 10: Timers	• Describe the different types of timers (SLO 5) • Understand the different types of timer values (SLO 5) • Demonstrate the ability to identify and trace out wirning in a diagram (SLO 2)
Week 11: Counters	• Describe the different types of counters (SLO 5) • Understand how fals-to-true transitions work (SLO 5) • Write a program that utilizes timers and counters (SLO 3, SLO 4)
Week 12: Creating Wire Diagrams	• Understand relay symbols (SLO 5) • Describe and comparte different types of relays and sensors (SLO 5) • Convert relay schematics into ladder programs (SLO 1, SLO 2, SLO 3) • Draft a simple PLC program (SLO 1, SLO 2, SLO 3)
Week 13: Documentation and Troubleshooting	• Understand what is included on PLC documentation (SLO 4) • Demonstrate programming abilities in a comprehensive project (SLO 2, SLO 3)
Week 14: Event Sequencing	• Understand the basics of event sequencing (SLO 2, SLO 4) • Demonstrate programming abilities in a comprehensive project (SLO 2, SLO 3)
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.

Course Schedule: **(Instructor Note: this course schedule is just a suggestion based on North Carolina System standards. You can adjust the schedule as suits your needs.)**

Week 1:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 2:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 3:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 4:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 5:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 6:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 7:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 8:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 9:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 10:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 11:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 12:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 13:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 14:

Monday Class 1 - Lecture Material - 1 Hour: Wednesday Class 2 - Lab Material - 1.5 Hours

Week 15:

Monday Class 1 - Final Exam

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 week, you will:

- Correctly identify parts of PLCs and their components (SLO 5)
- Describe the advantages of using PLCs (SLO 2)
- Accurately wire relay circuits per instructions (SLO 5)

Concept Content:

This week we start our course on PLCs. See module 1.2 for more details about what we will be doing this week.

This Week At A Glance:

Lectures:

Chapter 1 Programmable Logic Controllers Overview - 83 Slides

Source: Petruzella, F. (2023). *Programmable ogic Controllers*. McGraw Hill.

PLC Components Lecture - 21 Slides

Videos:

PLC Hardware Components - 8 Minutes - This video provides a visual component to the second lecture.

Assignments:

Module Review Quiz - Questions

Relay Basics Worksheet

1.2 Module Content Resources

Concept Content:

This week we will go over the basics of PLCs. This will include the various components of PLCs, the principles of PLC operations, and how to modify those operations.

This Week's Material:

Lectures:

Chapter 1 Programmable Logic Controllers Overview - 83 Slides

Source: Petruzella, F. (2023). *Programmable ogic Controllers*. McGraw Hill.

PLC Components Lecture - 21 Slides

Videos:

PLC Hardware Components - 8 Minutes - This video provides a visual component to the second lecture.

1.3 Module Assessment/Assignment

Concept Content:

This Week's Assignments:

Module Review Quiz - 5 Questions

Relay Basics Worksheet - Download the worksheet, we will work on it in class. This worksheet covers the basics of relays in circuits and going over how to construct basic circuits.

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:

By the end of this week, you will:

- Correctly identify parts of PLCs and their components (SLO 5)
- Describe the advantages of using PLCs (SLO 2)
- Accurately wire relay circuits per instructions (SLO 5)

Concept Content:

This week we started our course on PLCs. Next week we will focus on PLC architecture.

This Week In Review:

Lectures:

Chapter 1 Programmable Logic Controllers Overview - 83 Slides

PLC Components Lecture - 21 Slides

Videos:

PLC Hardware Components - 8 Minutes

Assignments:

Module Review Quiz - 5 Questions

Relay Basics Worksheet

Module 2

2.1 Module Overview

Concept Goals:

By the end of this week, you should:

- Understand the basics of how I/O module's work (SLO 1)
- Describe the differences between Computers and PLCs (SLO 5)
- Read a ladder logic diagram and input the logic accurately into a PLC (SLO 1, SLO 2)

Concept Content:

This week we will go over PLC architecture. See module 2.2 for more details.

This Week At A Glance:

Lectures:

PLC Overview A - 24 Slides

PLC Overview B - 32 Pages

Hardware Comonents - 86 Pages

Number Systems - 38 Slides

Videos:

What is Ladder Logic? - 8 Minutes

Assignments:

PLC Lab 1

PLC Lab 2

2.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we are going to expand upon the concepts we covered last week as well as introducing number systems and ladder logic. It will be a deeper dive on the fundamentals that are important to understand before we move further into the semester.

This Week's Material:

Lectures:

PLC Overview A - 24 Slides

PLC Overview B - 32 Pages

Hardware Comonents - 86 Pages

Number Systems - 38 Slides

Videos:

What is Ladder Logic? - 8 Minutes

2.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

PLC Lab 1

PLC Lab 2

Download the documents and we will work on the labs in class.

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:

- Understand the basics of how I/O module's work (SLO 1)
- Describe the differences between Computers and PLCs (SLO 5)
- Read a ladder logic diagram and input the logic accurately into a PLC (SLO 1, SLO 2)

Concept Content:

This week we went over PLC architecture. Next week we will work on setting up communications with a PLC.

This Week At A Glance:

Lectures:

PLC Overview A - 24 Slides

PLC Overview B - 32 Pages

Hardware Comonents - 86 Pages

Number Systems - 38 Slides

Videos:

What is Ladder Logic? - 8 Minutes

Assignments:

PLC Lab 1

PLC Lab 2

PLC Lab 3

Module 3

3.1 Module Overview

Concept Goals:

By the end of this week, you should:

- Describe how elements of ladder logic work (SLO 1)
- Read a ladder logic diagram and input the logic accurately into a PLC (SLO 1, SLO 2)

Concept Content:

This week we will look over how to set up communication with a PLC. See module 3.2 for more details.

This Week At a Glance:

Lectures:

Setting Up Communication With a PLC - 34 Slides

Fundamentals of Logic - 92 Slides

Videos:

How to Setup Communication between Studio 5000 and PLC - 1.5 Minutes

PLC Basics: Ladder Logic - 26 Minutes

Assignments:

PLC Lab 3

Module Review Quiz -6 Questions

3.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will look over how to set up communication with a PLC. This lecture will provide a visual example of how to set up communications with a PLC. We will also go over the fundamentals of logic, which is something you will need to know in order to use PLCs correctly.

This Week's Material:

Lectures:

Setting Up Communication With a PLC - 34 Slides

Fundamentals of Logic - 52 Slides - This lecture will go over PLC programming languages, processor organization, among other topics.

Videos:

How to Setup Communication between Studio 5000 and PLC - 1.5 Minutes - This video provides a visual walkthrough of how to set up communication between PLC and software. The process might work a little differently depending on the software you are using, but this video provides a general guide.

PLC Basics: Ladder Logic - 26 Minutes - This video has a visual explaination of ladder logic that can help supplement the material from the lectures.

3.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

PLC Lab 3

Module Review Quiz - 6 Questions

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 Objective:

- Describe how elements of ladder logic work (SLO 1)
- Read a ladder logic diagram and input the logic accurately into a PLC (SLO 1, SLO 2)

Concept Content:

This week we looked over how to set up communication with a PLC. Next week we will look into using Wireshark.

This Week In Review:

Lectures:

Setting Up Communication With a PLC - 34 Slides

Fundamentals of Logic - 92 Slides

Videos:

How to Setup Communication between Studio 5000 and PLC - 1.5 Minutes

PLC Basics: Ladder Logic - 26 Minutes

Assignments:

PLC Lab 3

Module Review Quiz -6 Questions

Module 4

4.1 Moudle Overview

Concept Goals:

By the end of this module, you should:

- Compare and contrast basic number systems (SLO 1)
- Convert decimals into their binary coded decimal representation (SLO 1)

Concept Content:

This week we will go over numbering systems. See module 4.2 for more detail.

This Week At a Glance:

Number Systems and Codes - 60 Slides

Using Wireshark Lecture - 6 Slides

Videos:

Wireshark Tutorial for Beginners - 20 Minutes

Number Systems Introduction - 11 Minutes

Assignments:

Module Review Quiz - 10 Questions

4.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we are going to look over number systems. We will have a breakdown of basic number systems, how they are used, and what they look like. We will also dedicate time to learning about Wireshark.

This Week's Material:

Number Systems and Codes - 60 Slides

Using Wireshark Lecture - 6 Slides

Videos:

Wireshark Tutorial for Beginners - 20 Minutes - This video gives a great introductory lecture with visuals to Wireshark.

Number Systems Introduction - 11 Minutes - This video gives a great introduction with visuals to some of the number systems from this week's lecture.

4.3 Moudle Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module Review Quiz - 10 Questions

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:

- Compare and contrast basic number systems (SLO 1)
- Convert decimals into their binary coded decimal representation (SLO 1)

Concept Content:

This week we covered number systems. Next week we will cover the basics of logic.

This Week In Review:

Number Systems and Codes - 60 Slides

Using Wireshark Lecture - 6 Slides

Videos:

Wireshark Tutorial for Beginners - 20 Minutes

Number Systems Introduction - 11 Minutes

Assignments:

Module Review Quiz - 10 Questions

Module 5

5.1 Module Overview

Concept Goals:

By the end of this week, you should:

- Understand how different logic gates work (SLO 1)
- Read a relay ladder diagram and change it into a ladder logic program (SLO 1, SLO 2, SLO 3)
- Work with Boolean equations while creating PLC ladder programs (SLO 1, SLO 2, SLO 3)

Concept Content:

This week we will look at the fundamentals of logic. See module 5.2 for more details.

This Week In Review:

Lectures:

Fundamentals of Logic - 52 Slides

Videos:

Logic Gates, Trugh Tables, Boolean Algebra, AND, OR, NOT, NAND, NOR gates - 12 Minutes

Assignments:

Module Review Quiz - 8 Questions

Logic Lab 1

Logic Lab 2

5.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will go over the fundamentals of logic. We will discuss the binary concepts, logic gate functions, Boolean Algebra, and starting a conversation on programming word level logic instructions.

This Week's Material:

Lectures:

Fundamentals of Logic - 52 Slides

Videos:

Logic Gates, Trugh Tables, Boolean Algebra, AND, OR, NOT, NAND, NOR gates - 12 Minutes - This video provides great visuals to go along with our discussion on fundamentals of logic this week.

5.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module Review Quiz - 8 Questions

Logic Lab 1

Logic Lab 2

Download the lab worksheets, we will work on them in class.

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:

- Understand how different logic gates work (SLO 1)
- Read a relay ladder diagram and change it into a ladder logic program (SLO 1, SLO 2, SLO 3)
- Work with Boolean equations while creating PLC ladder programs (SLO 1, SLO 2, SLO 3)

Concept Content:

This week we looked at the fundamentals of logic. Next week we will look at fundamentals of programming.

This Week In Review:

Lectures:

Fundamentals of Logic - 52 Slides

Videos:

Logic Gates, Trugh Tables, Boolean Algebra, AND, OR, NOT, NAND, NOR gates - 12 Minutes

Assignments:

Module Review Quiz - 8 Questions

Logic Lab 1

Logic Lab 2

Module 6

6.1 Module Overview

Concept Goals:

By the end of this module, you should:

- Describe different types of PLC programming languages (SLO 1, SLO 2, SLO 3)

- Describe parts of processor memory and memory space (SLO 1, SLO 2, SLO 3)
- Understand the factors that play into scan time (SLO 1, SLO 2, SLO 3)

Concept Content:

This week we will discuss the basics of PLC programming. See module 6.2 for more detail.

This Week At A Glance:

Lectures:

Basics of PLC Programming - 65 Slides

Basics of PLC Programming Pt. 2 - 16 Slides

Videos:

Programable Logic Controller Basics Explained - 15 Minutes

PLC Programming Tutorial for Beginners Part 1 - 11 Minutes

Assignment:

Module Review Quiz - 8 Questions

PLC Logic Lab 3

PLC Logic Lab 4

6.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will discuss the basics of PLC programming. We will discuss how processor memory is organized, the program scan cycle, PLC programming languages, among other topics that form the foundation of programming PLC.

This Week's Material:

Lectures:

Basics of PLC Programming - 65 Slides

Basics of PLC Programming Pt. 2 - 16 Slides

Source:

Videos:

Programable Logic Controller Basics Explained - 15 Minutes

PLC Programming Tutorial for Beginners Part 1 - 11 Minutes - This video is a great introduction to PLC programming and a good supplement for our textbook material this week.

6.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module Review Quiz - 8 Questions

PLC Logic Lab 3

PLC Logic Lab 4

Download the lab handouts, we will work on them in class.

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:

Module Learning Objectives:

- Describe different types of PLC programming languages (SLO 1, SLO 2, SLO 3)
- Describe parts of processor memory and memory space (SLO 1, SLO 2, SLO 3)
- Understand the factors that play into scan time (SLO 1, SLO 2, SLO 3)

Concept Content:

This week we discussed the basics of PLC programming. Next week we will have our mid-term exam.

This Week In Review:

Lectures:

Basics of PLC Programming - 65 Slides

Basics of PLC Programming Pt. 2 - 16 Slides

Videos:

Programable Logic Controller Basics Explained - 15 Minutes

PLC Programming Tutorial for Beginners Part 1 - 11 Minutes

Assignment:

Module Review Quiz - 8 Questions

PLC Logic Lab 3

PLC Logic Lab 4

Module 7

7.1 Module Overview

Concept Goals:

By the end of this module, you should:

- Demonstrate understanding of course material

Concept Content:

This week we will have our mid-term exam. This exam will cover the material for the first half of the semester.

To access the exam, go to the assignments tab and click on exam.

Mid-Term Exam - 30 Questions (Instructor Note: this is a bank of questions for you to use. You can choose to utilize all of them or you can click the live button to make it so that they won't appear for students. You are also free to add questions of your own based on the course material)

7.2 Module Wrap-Up

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

Thank you for your participation on this course thus far. Next week we will continue our work in the class.

Module 8

8.1 Module Overview

Concept Goals:

By the end of this week, you should:

- Understand different programming modes (SLO 2)
- Describe the shapes that represent inputs and outputs on a sketch (SLO 3)
- Demonstrate ability to program simple machines and programs (SLO 3, SLO 4, SLO 5)

Concept Content:

This week we will continue our look the basics of programming. See module 8.2 for more details.

This Week's Material:

Lectures:

Programming Basics - 23 Slides

Basics of PLC Programming - 41 Slides

Videos:

Create PLC Tags - 5 Minutes

Assignments:

Module Review Quiz - 5 Questions

Basic PLC Projects

8.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will continue our look the basics of programming. Topics will include instruction addressing, branch instructions, internal relay instructions, and entering ladder diagrams. We will also go over how to create PLC tags.

This Week's Material:

Lectures:

Programming Basics - 23 Slides

Basics of PLC Programming - 41 Slides

Videos:

Create PLC Tags - 5 Minutes

8.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module Review Quiz - 5 Questions

Basic PLC Projects

Download the project worksheet. We will work on the projects in class this week.

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:

- Understand different programming modes (SLO 2)
- Describe the shapes that represent inputs and outputs on a sketch (SLO 3)
- Demonstrate ability to program simple machines and programs (SLO 3, SLO 4, SLO 5)

Concept Content:

This week we continued our look the basics of programming. Next week we will cover PLC monitor control.

This Week In Review:

Lectures:

Programming Basics - 23 Slides

Basics of PLC Programming - 41 Slides

Videos:

Create PLC Tags - 5 Minutes

Assignments:

Module Review Quiz - 5 Questions

Basic PLC Projects

Module 9

9.1 Module Overview

Concept Goals:

By the end of this module, you should:

- Understand the basics of PLC Motor Control (SLO 2)
- Write a basic PLC program (SLO 3, SLO 4, SLO 5)

Concept Content:

This week we will go over program controls. See module 9.2 for details.

This Week At A Glance:

Lectures:

PLC Motor Control - 7 Slides

Textbook:

PLC Program Control Instructions -78 Slides

Assignment:

Week 9 Lab

9.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will go over program controls. We will talk about master control reset instructions, jump instructions, subroutine functions among other things.

This Week's Material:

Lectures:

PLC Motor Control - 7 Slides

Textbook:

PLC Program Control Instructions -78 Slides

Source:

9.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignment:

Week 9 Lab

Download the worksheet. We will work on the lab 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:

- Understand the basics of PLC Motor Control (SLO 2)
- Write a basic PLC program (SLO 3, SLO 4, SLO 5)

Concept Content:

This week we went over program controls. Next week we will cover timers.

This Week In Review:

Lectures:

PLC Motor Control - 7 Slides

Textbook:

PLC Program Control Instructions -78 Slides

Assignment:

Week 9 Lab

Module 10

10.1 Module Overview

Concept Goals:

By the end of this week, you should:

- Describe the different types of timers (SLO 5)
- Understand the different types of timer values (SLO 5)
- Demonstrate the ability to identify and trace out wiring in a diagram (SLO 2)

Concept Content:

This week we will look at programming timers using PLCs. See module 10.2 for more details.

This Week At A Glance:

Lectures:

Timers -7 Slides

Textbook:

Programming Timers -52 Slides

Videos:

PLC Timer Programming for Beginners - 10.5 Minutes

PLC Programming Examples and Solutions Using Timers - 10 Minutes

Assignments:

Module Review Quiz - 5 Questions

I/O Module Writing Lab

10.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will look at programming timers using PLCs. Topics include mechanical timing relays, timer instructions, on-delay and off-delay timer instructions among others.

This Week's Material:

Lectures:

Timers -7 Slides

Textbook:

Programming Timers -52 Slides

Videos:

PLC Timer Programming for Beginners - 10.5 Minutes

PLC Programming Examples and Solutions Using Timers - 10 Minutes

10.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module Review Quiz - 5 Questions

I/O Module Writing Lab

Download the document for the wiring lab. We will work on it in class. This weeks lab will be a review of I/O modules and how they function.

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:

- Describe the different types of timers (SLO 5)
- Understand the different types of timer values (SLO 5)
- Demonstrate the ability to identify and trace out wiring in a diagram (SLO 2)

Concept Content:

This week we looked at programming timers using PLCs. Next week we will discuss timers.

This Week In Review:

Lectures:

Timers -7 Slides

Textbook:

Programming Timers -52 Slides

Videos:

PLC Timer Programming for Beginners - 10.5 Minutes

PLC Programming Examples and Solutions Using Timers - 10 Minutes

Assignments:

Module Review Quiz - 5 Questions

I/O Module Writing Lab

Module 11

11.1 Module Overview

Concept Goals:

By the end of this week, you should:

- Describe the different types of counters (SLO 5)
- Understand how false-to-true transitions work (SLO 5)
- Write a program that utilizes timers and counters (SLO 3, SLO 4)

Concept Content:

This week we will go over programming counters. See module 11.2 for more details.

This Week At A Glance:

Lectures:

Counters - 8 Slides

Textbook:

Programming Counters - 56 Slides

Videos:

PLC Counter Programming for Beginners - 11 Minutes

Assignments:

Module Review Quiz - 5 Questions

Real Time Clock Lab

11.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will go over programming counters. Topics will include counter instructions, up-counters, down-counters, incremental encoder-counter applications, and more.

This Week's Material:

Lectures:

Counters - 8 Slides

Textbook:

Programming Counters - 56 Slides

Videos:

PLC Counter Programming for Beginners - 11 Minutes

11.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module Review Quiz - 5 Questions

Real Time Clock Lab

Download the worksheet for the clock lab, we will go over it in class. This lab combines knowledge of both timers and counters.

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 Objectives:

- Describe the different types of counters (SLO 5)
- Understand how false-to-true transitions work (SLO 5)
- Write a program that utilizes timers and counters (SLO 3, SLO 4)

Concept Content:

This week we will go over programming counters. Next week we work on wire diagrams.

This Week In Review:

Lectures:

Counters - 8 Slides

Textbook:

Programming Counters - 56 Slides

Videos:

PLC Counter Programming for Beginners - 11 Minutes

Assignments:

Module Review Quiz - 5 Questions

Real Time Clock Lab

Module 12

12.1 Module Overview

Concept Goals:

By the end of this module you should:

- Understand relay symbols (SLO 5)
- Describe and compare different types of relays and sensors (SLO 5)
- Convert relay schematics into ladder programs (SLO 1, SLO 2, SLO 3)
- Draft a simple PLC program (SLO 1, SLO 2, SLO 3)

Concept Content:

This week we will look over fundamentals of PLC wiring diagrams. See module 12.2 for more details.

This Week At A Glance:

Textbook:

Developing Fundamental PLC Wiring Diagrams - 64 Slides

Developing Fundamental PLC Wiring Diagrams Part 2 - 27 Slides

Videos:

Fundamentals of PLC Wiring Diagrams and Ladder Logic Programs - 52.5 Minutes

Types of Sensors - 8.5 Minutes

How to Wire Sensors to a PLC part 1 - 5.5 Minutes

How to Wire Sensors to a PLC part 2 - 9 Minutes

Assignments:

Module Review Quiz - 7 Questions

Ready to Program Lab

12.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we are discussing wiring diagrams. Topics include electromagnetic control relays, contactors, motor starters, etc.

This Week's Material:

Textbook:

Developing Fundamental PLC Wiring Diagrams - 64 Slides

Developing Fundamental PLC Wiring Diagrams Part 2 - 27 Slides

Videos:

Fundamentals of PLC Wiring Diagrams and Ladder Logic Programs - 52.5 Minutes

Types of Sensors - 8.5 Minutes

How to Wire Sensors to a PLC part 1 - 5.5 Minutes

How to Wire Sensors to a PLC part 2 - 9 Minutes

We are covering sensors as well this week.

12.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignments:

Module Review Quiz - 7 Questions

Ready to Program Lab

Download the worksheet. We will work on it in class.

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:

- Understand relay symbols (SLO 5)
- Describe and compare different types of relays and sensors (SLO 5)
- Convert relay schematics into ladder programs (SLO 1, SLO 2, SLO 3)
- Draft a simple PLC program (SLO 1, SLO 2, SLO 3)

Concept Content:

This week we discussed the fundamentals of PLC wiring diagrams and demonstrated that knowledge through our review quiz and lab. Next week we will discuss documentation and troubleshooting.

This Week In Review:

Textbook:

Developing Fundamental PLC Wiring Diagrams - 64 Slides

Developing Fundamental PLC Wiring Diagrams Part 2 - 27 Slides

Videos:

Fundamentals of PLC Wiring Diagrams and Ladder Logic Programs - 52.5 Minutes

Types of Sensors - 8.5 Minutes

How to Wire Sensors to a PLC part 1 - 5.5 Minutes

How to Wire Sensors to a PLC part 2 - 9 Minutes

Assignments:

Module Review Quiz - 7 Questions

Ready to Program Lab

Module 13

13.1 Module Overview

Concept Goals:

By the end of this week, you should:

- Understand what is included on PLC documentation (SLO 4)
- Demonstrate programming abilities in a comprehensive project (SLO 2, SLO 3)

Concept Content:

This week we will look into documentation and troubleshooting. See module 13.2 for more details.

This Week At A Glance:

Videos:

PLC Questions on Documentation - 10.5 Minutes

Ladder Logic Documentation - 39 Minutes

PLC Troubleshooting 101: Basics - 7.5 Minutes

PLC Troubleshooting 101: Basic Steps to Diagnose and Fix your Machine - 37 Minutes

Worksheets:

Documentation and Troubleshooting Tools

Documentation Notes

Assignment:

PLC Programming Project

13.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week we will look into documentation and troubleshooting. We will look into what is written on PLC documents, and how the documentation process works. We will also take a look into the basics of troubleshooting.

This Week's Material:

Videos:

PLC Questions on Documentation - 10.5 Minutes

Ladder Logic Documentation - 39 Minutes

PLC Troubleshooting 101: Basics - 7.5 Minutes

PLC Troubleshooting 101: Basic Steps to Diagnose and Fix your Machine - 37 Minutes

Worksheets:

Documentation and Troubleshooting Tools

Documentation Notes

13.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignment:

PLC Programming Project

Download the worksheet. We will work on this in class.

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:

By the end of this week, you should:

- Understand what is included on PLC documentation (SLO 4)

- Demonstrate programming abilities in a comprehensive project (SLO 2, SLO 3)

Concept Content:

This week we looked into documentation and troubleshooting. Next week we will look over event sequencing.

This Week In Review:

Videos:

PLC Questions on Documentation - 10.5 Minutes

Ladder Logic Documentation - 39 Minutes

PLC Troubleshooting 101: Basics - 7.5 Minutes

PLC Troubleshooting 101: Basic Steps to Diagnose and Fix your Machine - 37 Minutes

Worksheets:

Documentation and Troubleshooting Tools

Documentation Notes

Assignment:

PLC Programming Project

Module 14

14.1 Module Overview

Concept Goals:

By the end of this module, you should:

- Understand the basics of event sequencing (SLO 2, SLO 4)
- Demonstrate programming abilities in a comprehensive project (SLO 2, SLO 3)

Concept Content:

This week we will take a look at event sequencing. See module 14.2 for more details.

This Week At A Glance:

Lectures:

Event Sequencing - 7 Slides

Videos:

PLC Programming Sequence of Events - 6.5 Minutes

Allen Bradley PLC Sequence Programming Tutorial - 18 Minutes

Programming with PLC Memory Bits - 11.5 Minutes

Assignment:

PLC Programming Project Week 2

14.2 Module Content Resources

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This week,

This Week's Material:

Lectures:

Event Sequencing - 7 Slides

Videos:

PLC Programming Sequence of Events - 6.5 Minutes

Allen Bradley PLC Sequence Programming Tutorial - 18 Minutes

Programming with PLC Memory Bits - 11.5 Minutes

14.3 Module Assessment/Assignment

Concept Goals:

Outline the learning goals for this module here.

Concept Content:

This Week's Assignment:

PLC Programming Project Week 2

This week we are going to finish our comprehensive PLC programming project.

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:

- Understand the basics of event sequencing (SLO 2, SLO 4)
- Demonstrate programming abilities in a comprehensive project (SLO 2, SLO 3)

Concept Content:

This week we took a look at event sequencing. Next week we will take our final exam.

This Week In Review:

Lectures:

Event Sequencing - 7 Slides

Videos:

PLC Programming Sequence of Events - 6.5 Minutes

Allen Bradley PLC Sequence Programming Tutorial - 18 Minutes

Programming with PLC Memory Bits - 11.5 Minutes

Assignment:

PLC Programming Project Week 2

Module 15 - Final Exam

15.1 Final Exam

Concept Goals:

By the end of this module, you should:

- Demonstrate understanding of course material

Concept Content:

This week we will take our final exam. To access it, click on the assignments tab and look under the test section.

Final Exam - 48 Questions

15.2 Course Wrap-Up

Concept Content:

Thank you for your participation in this course. Wish the best for you moving forward in this program.

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.