



Lesson Plan No.1	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the basic of Programmable Logic Controllers b. Illustrate the classification of Programmable Logic Controllers
Teaching Aids (if any)	a. PPT b. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes) - Ask questions about programmable logic controllers - Drawback of wiring of automation systems - Need of automation systems - Need of interfacing Development (30 minutes) a. Concept of Programmable logic controller b. Introduction; definition & history of the PLC c. Description of automation detail d. Classification Programmable logic controller. e. Explain the concept of sensor f. Practical explanation of sensor. g. need of actuators (interfacing device between PLC output and load) Exercise (5 minutes) – Ask students to explain to practical example of PLC. - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work 3. Suggested Video lecture https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Nearpod Quiz on basics of programmable logic controllers Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 02	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the need of automations in industries b. principle of operation c. Understand of various components of programmable logic controllers
Teaching Aids (if any)	a. Chalk & board
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lectur - Ask questions about need of automations - Drawback of wiring of automation systems - Need of PLC in automation systems - Advantage and disadvantage of automation systems 2. Development (30 minutes) a. Concept of need of automations in industries b. Component involved in automations in industries c. Hardware description of automation systems d. principle of operation components involve in automation e. various components of programmable logic controllers f. CPU, memory, address bus, data bus & controlling instruction of PLC 3. Exercise (5 minutes) – Ask students to explain to need of automation - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b



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	8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work 3. Suggested Video lecture https:// https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on need of automations in industries, principle of operation of hardware model, understand of various components of programmable logic controllers. Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 03	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the basic components of PLC like CPU & programmer/monitors, PLC input & output modules b. Understand of the processor, power supplies principle of operation of PLC
Teaching Aids (if any)	a. PPT b. Chalk & board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions about need of basic components of PLC - Working principle and instruction flow into PLC - Need of monitors, PLC input & output modules - Data flow in PLC and generating control action by PLC 2. Development (30 minutes) a. Concept of basic components of PLC like CPU & programmer/monitors b. PLC input & output modules c. processor & its capacity d. power supplies principle of operation of PLC d. principle of operation of PLC & instruction flow for generating the control action 3. Exercise (5 minutes) – Ask students to explain to need of automation - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
	Use Nearpod to collect responses and discuss the answers.



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Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work based on different memory capacity of PLC & problem based on components of PLC 3. Suggested Video lecture https:// https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on PLC: CPU & programmer/ monitors; PLC input & output modules; the processor; power supplies Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 04	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the basic of PLC wiring b. Illustrate the advantages & disadvantages: PLC versus Computers c. Understand of the PLC Applications
Teaching Aids (if any)	a. PPT b. Chalk & board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions about wiring of PLC - Advantages & disadvantages of PLC 2. Development (30 minutes) a. PLC wiring, identification of IO devices and their interfacing & wiring b. Advantages & disadvantages c. Difference between PLC and Computers d. PLC Applications 3. Exercise (5 minutes) – Ask students to explain to need of automation - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work based on interfacing & wiring of PLC 3. Suggested Video lecture



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	https:// https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on PLC: sensors, actuators connection & wiring to the PLC Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 05	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the Programming equipment of PLC; b. Illustrate the proper construction of PLC ladder diagrams c. Able to write the programming using PLC for small project
Teaching Aids (if any)	a. PPT b. Chalk & board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions about types of programming e.g. functional block diagram, ladder logic, structured text, sequential function chart & instruction list - Ask question about GX works3 programming software 2. Development (30 minutes) a. Explain Programming equipment of PLC & its installation process b. Ladder logic development of PLC c. Explain the writing the program using software d. Different software for different PLC 3. Exercise (5 minutes) – - Ask students to explain to need of programming - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.



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Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for writing program for small process 3. Suggested Video lecture https:// https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on program for small process Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 06	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the process scanning consideration b. Illustrate the Introduction to PLC Trainer Device and PLC Software
Teaching Aids (if any)	a. PPT b. Chalk & board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions scanning of PLC programming - Ask question about rungs and supply - Ask question about PLC Trainer Device 2. Development (30 minutes) a. Explain the scanning process of PLC b. Explain different scanning approach for different type of PLC c. Explain different types of PLC Trainer Devices d. Explain modular type PLC & compact type training devices e. Explain PLC software for the programming of process 3. Exercise (5 minutes) – - Ask students to explain to need of different types of PLC Trainer Devices - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation



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	from students on these. 2. Home work for explanation of different types of PLC Trainer Devices according to level of industry 3. Suggested Video lecture https:// https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on program for scanning process of PLC Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 07	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the fundamental commands of PLC b. Illustrate the types of programming & operators are used for programming
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions about commands of PLC - Ask question about instruction set - Ask question about symbol and notation used for ladder programming 2. Development (30 minutes) a. Explain the fundamental commands of PLC b. Explain different types of symbol and notation of commands c. Explain physical significance & concepts of push button d. Explain NO/NC concepts in switches e. Explain source and sink mode with proper command application 3. Exercise (5 minutes) – - Ask students to explain to need of different types fundamental commands of PLC - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.



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Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for explanation of different types of fundamental commands of PLC 3. Suggested Video lecture https:// https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on fundamental commands of PLC Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 08	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the PLC Hardware Components b. Illustrate the The I/O section, Discrete I/O Modules
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions about hardware components PLC - Ask question components involve in PLC hardware - Ask question about I/O section, Discrete I/O Modules 2. Development (30 minutes) a. Explain the PLC Hardware Components b. Explain I/O section c. Explain discrete I/O Modules d. Explain the signal generated for its discrete I/O Modules 3. Exercise (5 minutes) – - Ask students to explain PLC Hardware Components - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for PLC Hardware Components 3. Designing of PLC for different I/O Modules 4. Suggested Video lecture https:// https://www.youtube.com/embed/4F5PTPGv5Mo



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	Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on PLC Hardware Components, types of PLC for different I/O Modules Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 09	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the analog I/O modules, special I/O modules b. Illustrate the I/O specifications
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions about I/O interpretation - Ask question I/O port of PLC - Ask question interfacing parts of I/O devices 2. Development (30 minutes) a. Explain the analog I/O modules, special I/O modules b. Explain I/O specifications c. Explanation of I/O interfacing devices d. Explain the complete model hardware 3. Exercise (5 minutes) – - Ask students to explain analog I/O modules, special I/O modules - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for analog I/O modules, special I/O modules 3. Suggested Video lecture



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	https:// https://www.youtube.com/embed/4F5PTPGv5Mo Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on analog I/O modules, special I/O modules Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 10	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the sourcing and sinking concept b. Illustrate the programming devices
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions about sourcing and sinking concept - Ask question supply for sourcing and sinking node - Ask question about programming devices 2. Development (30 minutes) a. Explain the sourcing and sinking concept b. Explain the concept for wiring of sourcing and sinking node c. Explanation of programming devices e.g. handheld programming , systems programming d. Explain selection of controllers for different types of programmings 3. Exercise (5 minutes) – - Ask students to explain the sourcing and sinking concept - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wlurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for sourcing and sinking concept & its wiring



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	3. Suggested Video lecture https:// https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Nearpod Quiz on sourcing and sinking concept & its wiring Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 11	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the CPU, memory types of PLC b. Illustrate the programming devices & fundamentals of logic of PLC programming
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on CPU of PLC, memory of PLC - Difference between CPU and memory of PLC - Ask question on programming devices of PLC - Fundamental concept for programming of PLC 2. Development (30 minutes) a. Explain the structure of CPU & memory of PLC b. Explain the instruction flowing between CPU & memory of PLC c. Explanation of programming devices e.g. handheld programming , systems programming d. Explain selection of controllers for different types of programming 3. Exercise (5 minutes) – - Ask students to explain the CPU & memory of PLC - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.



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Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for CPU & memory of PLC 3. Suggested Video lecture https:// https://www.youtube.com/embed/vrqV-O_gagg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on CPU & memory of PLC, Fundamental concept for programming of PLC Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 12	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the binary concept, AND, OR and NOT functions b. Illustrate the Boolean algebra
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on binary logic concept - Ask student to explain the AND, OR and NOT functions for ladder logic - Ask question based on Boolean algebra - Ask student for programming of Boolean algebra using PLC 2. Development (30 minutes) a. Explain the binary concept b. Explain the programming based on AND, OR and NOT functions c. Explanation of programming for Boolean algebra d. Explain the programming by using GX works2/ GX works3 e. transfer the program from programming device to PLC f. connecting the cable and explanation of program loading into PLC memory 3. Exercise (5 minutes) – - Ask students to explain the programming based on AND, OR and NOT functions - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit



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	Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for programming based on AND, OR and NOT functions 3. Suggested Video lecture https:// https://www.youtube.com/embed/QHZrSzdIxW0 Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on programming based on AND, OR and NOT functions Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 13	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the developing circuits from Boolean expressions b. Illustrate the Producing the Boolean equation from given circuits
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on Boolean expressions - Ask student to explain the feedback involved into Boolean expressions - Ask question based on complementary equation in Boolean algebra - Ask student for programming in feedback involved into Boolean expressions 2. Development (30 minutes) a. Explain the Boolean expressions and its programming using GX Works3 b. Explain the hardware implementation for Boolean expressions c. Explanation of programming on complementary equation in Boolean algebra d. Explain the programming by using GX works2/ GX works3 e. transfer the program from programming device to PLC f. connecting the cable and explanation of program loading into PLC memory 3. Exercise (5 minutes) – - Ask students to explain the programming based on



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	complementary equation in Boolean algebra - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for programming based on AND, OR and NOT functions 3. Suggested Video lecture https:// https://www.youtube.com/embed/QHZrSzdIxW0 Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on programming based on complementary equation in Boolean algebra Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 14	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the hardwired logic versus programmed logic b. Illustrate the programming word level logic instructions.
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions difference between hardwired logic versus programmed logic - Ask student to explain the feedback involved into Boolean expressions - Ask question based on hardwired logic implementation - Ask student for programming word level logic instructions 2. Development (30 minutes) a. Explain the hardwired logic versus programmed logic b. Explain the hardware implementation for the process c. Explanation of hardware implementation using sensors & actuators d. Explain of logic programming by using GX works2/ GX works3 e. Explanation of difference between hardwired logic versus programmed logic f. interfacing the hardwired logic and programmed logic to complete the process 3. Exercise (5 minutes) – - Ask students to explain the difference between hardwired logic versus programmed logic - Use Nearpod to collect responses and discuss the answers. - Quiz link



	- https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for programming based hardware implementation using sensors & actuators 3. Suggested Video lecture https://www.youtube.com/embed/WqagKjueBEE Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on programming based hardware implementation using sensors & actuators Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 15	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the converting relay schematics and Boolean equations into PLC ladder programs b. Illustrate the concept of relay into PLC programming
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on relay - Ask student to explain the application of relay into automation - Ask question programming of relay into PLC - Ask student for instruction of relay module 2. Development (30 minutes) a. Explain the converting relay schematics and Boolean equations into PLC ladder programs b. Explain the programming instruction relay module into PLC c. Explanation of preset value, actual value and done bit of relay d. Explain of programming of relay by using GX works2/ GX works3 e. Explanation of inbuilt relay into PLC & external relay f. programming of converting relay schematics and Boolean equations into PLC ladder programs 3. Exercise (5 minutes) – - Ask students to explain the converting relay schematics and Boolean equations into PLC ladder programs - Use Nearpod to collect responses and discuss the answers. - Quiz link



	- https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for of preset value, actual value and done bit of relay and controlling on/off state of motor by using relay and PLC programming 3. Suggested Video lecture https:// https://www.youtube.com/embed/WqagKjueBEE Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on programming based on preset value, actual value and done bit of relay Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 16	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: - Understand the writing a ladder logic program directly from a narrative description - Illustrate hardware model for any narrative description
Teaching Aids (if any)	- PPT - Chalk & talk and board - Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions design of any project model - Ask student to necessary & sufficient condition to fulfil the project idea - Ask question about interfacing of narrative description - Ask student for signalling conditioning for achieving the desired potential for the narrative description Development (30 minutes) - Explain to writing a ladder logic program directly from a narrative description - design of any project model using PLC - Explanation of necessary & sufficient condition to fulfil the project idea - Explain of interfacing of narrative description - Explanation of signalling conditioning for achieving the desired potential for the narrative description - Final discussion on narrative description form the component involve in the design of the project Exercise (5 minutes) – - Ask students to explain necessary & sufficient condition to fulfil the project idea



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	- Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work to design the project and explain the necessary & sufficient condition to fulfil the project Suggested Video lecture https:// www.youtube.com/embed/WqagKjueBEE Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on programming based on sensor and actuators for signal conditioning Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 17	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the programming of timers and mechanical timing relay b. Illustrate the different type of timers and mechanical timing relay
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask based on timers - Ask student to explain the need of timers - Ask question on mechanical relay - Ask student for signalling conditioning timers - Ask question the difference between timers and mechanical timing relay 2. Development (30 minutes) a. Explain the basic concept of timers b. instruction set for timer, working description of timers, may be input or output c. Explanation of done bit, preset value and accumulated/actual value d. controlling some hardware by operation by timers e. Explanation of mechanical timing relay f. Signal conditioning for mechanical timing relay 3. Exercise (5 minutes) – - Ask students to explain the idea of timer and relay - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit



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	Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work write notes on different types of mechanical relay Suggested Video lecture https:// https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on programming based on timer, preset value, actual value calculation of different types of timer Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 18	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the timer instructions, ON delay timer instruction, Off-delay timer instruction b. Illustrate the types of timer & its operation
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on timers - Ask student to explain the type of timer - Ask question based on low speed, high speed & very high speed of timer - Ask question based on ON delay timer instruction, Off-delay timer instruction 2. Development (30 minutes) a. Explain the timers in details b. Explain the low speed, high speed & very high speed of timer c. Explanation accumulator value, preset value & done bit of low speed, high speed & very high speed of timer d. Explain the programming of low speed, high speed & very high speed of timer by using GX works2/ GX works3 e. Explain ON delay timer instruction and Off-delay timer instruction f. Programming of -ON delay timer instruction, Off-delay timer instruction using GX works3 3. Exercise (5 minutes) – - Ask students to explain low speed, high speed & very high speed of timer



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	- Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for accumulator value, preset value & done bit of low speed, high speed & very high speed of timer 3. Suggested Video lecture https:// https://www.youtube.com/embed/wJ1dejAGjZU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on accumulator value, preset value & done bit of low speed, high speed & very high speed of timer Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 19	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the retentive timer & cascading timers b. Illustrate the examples of timer function industrial application
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on timer & retentive timer - Ask student to explain the retentive timer - Ask question why retentive timer is used - Ask question based on cascading timers - Ask question based on cascading timers which is used in industry 2. Development (30 minutes) a. Explain the difference between timer & retentive timer b. Explain the retentive timer c. Explanation cascading timers & its physical significance d. Explain the programming retentive timer by using GX works2/ GX works3 e. Explain cascading timers f. Practice for programming of cascading timers 3. Exercise (5 minutes) – - Ask students to explain the difference between timer & retentive timer - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit



	Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for difference between timer & retentive timer 3. Suggested Video lecture https:// https://www.youtube.com/embed/wJ1dejAGjZU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on examples of timer function in industrial application Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 20	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the industrial process timing application b. Illustrate the types of networking in PLC
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on industrial process timing application - Ask student to explain the PC to PLC communication - Ask question to explain PLC to PLC communication - Ask question based communication between different modules - Ask question for at least one question for as said communication Development (30 minutes) - Explain the industrial process timing application - Explain the importance of timing application - Explanation types of networking in PLC - Explain explain the PC to PLC communication - explain PLC to PLC communication - explain the communication between different modules Exercise (5 minutes) – - Ask students to explain industrial process timing application - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.



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Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for the question based on industrial process timing application & networking in PLC 3. Suggested Video lecture https:// https://www.youtube.com/embed/v2WRQj34ckc Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on networking in PLC Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 21	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the levels of industrial control b. Illustrate the types of levels of industrial control using PLC
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions on levels of industrial control - Ask student to explain types of levels of industrial control using PLC - Ask question to all five levels in industrial automation - Ask question of importance of PLC in level controlling of industry - Ask question about reason for levelling in industrial controlling 2. Development (30 minutes) a. Explain the levels of industrial control b. Explain the importance of types of levels of industrial control using PLC c. Explanation of all five levels in industrial automation d. Explain the difference between five levels in industrial automation e. explain the examples of five levels in industrial automation f. explain the complete wiring and flow of control information from lower level to higher level 3. Exercise (5 minutes) – - Ask students to explain levels of industrial control - Use Nearpod to collect responses and discuss the answers. - Quiz link



	- https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for flow of control information from lower level to higher level 3. Suggested Video lecture https:// www.youtube.com/embed/v2WRQi34ckc Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on component involve in different level industrial control Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 22	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the programming of counters b. Illustrate the types up-counter, down counter, up-down counter c. Articulate the idea of counter for the automation systems d. Write the program for counter and interface it to other devices
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions concept of counters - Ask student to explain the uses of counter in automation domain - Ask question to define the type of counters - Ask question about instruction set & representation of counter in PLC - Ask question about the difference between timer and counter 2. Development (30 minutes) a. Explain the concept of counters b. Explain the importance of types of levels of industrial control using PLC c. Explanation the uses of counter in automation domain d. Explain the type of counters e. explain the instruction set & representation of counter in PLC f. explain up-counter & down counter g. Explain small project based on counter & hardware implementation of the project 3. Exercise (5 minutes) – - Ask students to explain concept of counters - Use Nearpod to collect responses and discuss the answers.



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	- Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for application of counter 3. Suggested Video lecture https:// https://www.youtube.com/embed/v2WRQi34ckc Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on up-counter, down-counter, accumulator value & preset value Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 23	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the combining of counter and timer functions b. Illustrate the idea where both are used together c. Articulate the idea of counter is followed by timer & vice-versa d. Write the program for the project based on counter and timer functions are used together
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions concept of combining of counter and timer functions - Ask student to why counter and timer functions are combined together - Ask question about programming of combining of counter and timer - Ask question about counter and timer functions used together - Ask question about the difference between timer and counter 2. Development (30 minutes) a. Explain the concept of counters b. Explain the importance of combining of counter and timer functions c. Explanation the idea of counter is followed by timer & vice-versa d. Explain the programming of combining of counter and timer e. Explain the application where counter and timer are used together f. programming for combination of counter and timer by using



	modular and compact PLC g. Explain small project based on counter & hardware implementation of the project 3. Exercise (5 minutes) – - Ask students to explain concept of combining of counter and timer functions - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for combining of counter and timer functions 3. Suggested Video lecture https:// https://www.youtube.com/embed/1 svxliwQWU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on combining of counter and timer functions Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 24	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the cascading counters b. Illustrate the incremental encoder counter applications c. Explain the type & working of the incremental encoder d. Articulate the idea & hardware implementation of incremental encoder
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions of limitation of counter functions - Ask student to why cascading counters are used - Ask question about incremental encoder of counter - Ask question about type & working of the incremental encoder - Ask question about the idea & hardware implementation of incremental encoder 2. Development (30 minutes) a. Explain the limitation of counters b. Explain the importance of cascading counters c. Explanation the uses of cascading counters for practical applications d. Explain the idea of incremental encoder counter applications e. Explain the type & working of the incremental encoder f. idea & hardware implementation of incremental encoder g. Explain small project based on incremental encoder & PLC 3. Exercise (5 minutes) – - Ask students to explain cascading counters & its applications - Use Nearpod to collect responses and discuss the answers.



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	- Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for incremental encoder counter applications 3. Suggested Video lecture https:// https://www.youtube.com/embed/1_svxliwQWU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on cascading of counter and type of incremental encoder Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 25	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: - Understand the cascading of timers and counters - Illustrate the application and programming of cascading of timers and counters - Illustrate the various brands of PLCs and their evaluation - Explain the IO, memory capacity, software for various brands of PLCs - Articulate the application based selection of modular and compact PLC
Teaching Aids (if any)	- PPT - Chalk & talk and board - Use of Nearpod tool for online quiz
Teaching Development	Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions of cascading of timers and counters - Ask question from student about application of cascading of timers and counters - Ask question about programming of cascading of timers and counters - Ask question about the various brands of PLCs and their evaluation - Ask question about the IO, memory capacity, software for various brands of PLCs Development (30 minutes) - Explain the cascading of timers and counters - Explain the application of cascading of timers and counters - Explanation the uses of cascading counters for practical applications - Explain the programming of cascading of timers and counters



	e. Explain the various brands of PLCs and their evaluation f. Explain the IO capacity, memory capacity, software for various brands of PLCs g. Explain different types of software for different PLC & their compatible mode 3. Exercise (5 minutes) – - Ask students to explain cascading of timers and counters & their applications - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for various type of PLC, memory mapping, different IO capacity 3. Suggested Video lecture https:// www.youtube.com/embed/1_svxliwQWU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on cascading of counter and type of incremental encoder Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 26	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the overview of Siemens PLC b. Understand the overview of Allen Bradley PLC & Schneider electric PLC c. Illustrate the software used for Siemens PLC Allen Bradley PLC, Schneider electric PLC d. Illustrate the IO ports, specification, instruction set, addressing registers for various types of PLC
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions of overview of Siemens PLC - Ask question on overview of Allen Bradley PLC & Schneider electric PLC - Ask question about software of the Siemens PLC, Allen Bradley PLC & Schneider electric PLC - Ask question about IO port of Siemens PLC, Allen Bradley PLC & Schneider electric PLC - Ask question about the instruction set, timer programming, counter programming for various brands of PLCs 2. Development (30 minutes) a. Explain the overview of Siemens PLC b. Explain the overview of Siemens PLC c. Explanation the overview of Allen Bradley PLC & Schneider electric PLC d. Explain about IO port of Siemens PLC, Allen Bradley PLC & Schneider electric PLC



	e. Explain the various brands of PLCs and their evaluation f. Explain the IO capacity, memory capacity, software for various brands of PLCs g. Explain different types of software for different PLC & their compatible mode 3. Exercise (5 minutes) – - Ask students to explain cascading of timers and counters & their applications - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	- Summarize the Lesson Learning Outcomes and get affirmation from students on these. - Home work for various type of PLC, memory mapping, different IO capacity - Suggested Video lecture https:// www.youtube.com/embed/1 svxliwQWU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	- Reflective Questions (What, Why, Who?). Allow students to answer and discuss. - Nearpod Quiz on cascading of counter and type of incremental encoder Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 27	Course Name: Introduction to PLC & SCADA	Course No.: EE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the Omron PLC b. Understand the Mitsubishi PLC c. Illustrate the software used Omron PLC & Mitsubishi PLC d. Illustrate the IO ports, specification, instruction set, addressing registers for Omron PLC & Mitsubishi PLC
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions of overview of Omron PLC - Ask question on overview of Mitsubishi PLC - Ask question about software of the Omron PLC & Mitsubishi PLC - Ask question about IO port of Omron PLC & Mitsubishi PLC - Ask question about the instruction set, timer programming, counter programming for Omron PLC & Mitsubishi PLC 2. Development (30 minutes) a. Explain the overview of Omron PLC b. Explain the overview of Mitsubishi PLC c. Explain about IO port of Omron PLC & Mitsubishi PLC d. Explain the IO capacity, memory capacity, software for Omron PLC & Mitsubishi PLC g. Explain different types of software for Omron PLC & Mitsubishi PLC & their compatible mode 3. Exercise (5 minutes) – - Ask students to explain Omron PLC & Mitsubishi PLC - Use Nearpod to collect responses and discuss the answers.



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	- Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for memory mapping, different IO capacity Omron PLC & Mitsubishi PLC 3. Suggested Video lecture https:// www.youtube.com/embed/ORMYo_imRbw Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on development stage of Omron PLC & Mitsubishi PLC Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 28	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the networking PLC b. Understand the wired communication in PLC c. Illustrate the shielded twisted pair communication in PLC d. Illustrate the Unshielded Twisted pair communication in PLC
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions on networking PLC - Ask question on wired communication in PLC - Ask question about Unshielded Twisted pair communication in PLC 2. Development (30 minutes) a. Explain the networking in PLC a. Explain the serial & parallel communication in PLC b. Explain the master-slave communication in PLC c. Explain wired communication in PLC. c. Explain Unshielded Twisted pair communication in PLC 3. Exercise (5 minutes) – Ask students to explain the networking in PLC - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.



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	2. Home work on Unshielded Twisted pair communication in PLC 3. Suggested Video lecture https:// https://www.youtube.com/embed/ORMYo_imRbw Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on Unshielded Twisted pair communication in PLC Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 29	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the networking PLC b. Understand the wired communication in PLC c. Illustrate the shielded twisted pair communication in PLC d. Illustrate the Unshielded Twisted pair communication in PLC
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions on networking PLC - Ask question on wired communication in PLC - Ask question about Unshielded Twisted pair communication in PLC 2. Development (30 minutes) a. Explain the networking in PLC a. Explain the serial & parallel communication in PLC b. Explain the master-slave communication in PLC c. Explain wired communication in PLC. c. Explain Unshielded Twisted pair communication in PLC 3. Exercise (5 minutes) – Ask students to explain the networking in PLC - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.



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	2. Home work on Unshielded Twisted pair communication in PLC 3. Suggested Video lecture https:// https://www.youtube.com/embed/ORMYo_imRbw Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on Unshielded Twisted pair communication in PLC Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 30	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the programming of counters b. Illustrate the types up-counter, down counter, up-down counter c. Articulate the idea of counter for the automation systems d. Write the program for counter and interface it to other devices
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions concept of counters - Ask student to explain the uses of counter in automation domain - Ask question to define the type of counters - Ask question about instruction set & representation of counter in PLC - Ask question about the difference between timer and counter 2. Development (30 minutes) a. Explain the concept of counters b. Explain the importance of types of levels of industrial control using PLC c. Explanation the uses of counter in automation domain d. Explain the type of counters e. explain the instruction set & representation of counter in PLC f. explain up-counter & down counter g. Explain small project based on counter & hardware implementation of the project 3. Exercise (5 minutes) – - Ask students to explain concept of counters - Use Nearpod to collect responses and discuss the answers.



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	- Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for application of counter 3. Suggested Video lecture https:// https://www.youtube.com/embed/v2WRQi34ckc Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on up-counter, down-counter, accumulator value & preset value Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 31	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the levels of industrial control b. Illustrate the types of levels of industrial control using PLC
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions on levels of industrial control - Ask student to explain types of levels of industrial control using PLC - Ask question to all five levels in industrial automation - Ask question of importance of PLC in level controlling of industry - Ask question about reason for levelling in industrial controlling 2. Development (30 minutes) a. Explain the levels of industrial control b. Explain the importance of types of levels of industrial control using PLC c. Explanation of all five levels in industrial automation d. Explain the difference between five levels in industrial automation e. explain the examples of five levels in industrial automation f. explain the complete wiring and flow of control information from lower level to higher level 3. Exercise (5 minutes) – - Ask students to explain levels of industrial control - Use Nearpod to collect responses and discuss the answers. - Quiz link



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	- https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for flow of control information from lower level to higher level 3. Suggested Video lecture https:// https://www.youtube.com/embed/v2WRQi34ckc Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on component involve in different level industrial control Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 32	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the industrial process timing application b. Illustrate the types of networking in PLC
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on industrial process timing application - Ask student to explain the PC to PLC communication - Ask question to explain PLC to PLC communication - Ask question based communication between different modules - Ask question for at least one question for as said communication 2. Development (30 minutes) a. Explain the industrial process timing application b. Explain the importance of timing application c. Explanation types of networking in PLC d. Explain explain the PC to PLC communication e. explain PLC to PLC communication f. explain the communication between different modules 3. Exercise (5 minutes) – - Ask students to explain industrial process timing application - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.



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Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for the question based on industrial process timing application & networking in PLC 3. Suggested Video lecture https:// <u>https://www.youtube.com/embed/v2WRQj34ckc</u> Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on networking in PLC Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 33	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the retentive timer & cascading timers b. Illustrate the examples of timer function industrial application
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on timer & retentive timer - Ask student to explain the retentive timer - Ask question why retentive timer is used - Ask question based on cascading timers - Ask question based on cascading timers which is used in industry 2. Development (30 minutes) a. Explain the difference between timer & retentive timer b. Explain the retentive timer c. Explanation cascading timers & its physical significance d. Explain the programming retentive timer by using GX works2/ GX works3 e. Explain cascading timers f. Practice for programming of cascading timers 3. Exercise (5 minutes) – - Ask students to explain the difference between timer & retentive timer - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit



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	Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for difference between timer & retentive timer 3. Suggested Video lecture https:// https://www.youtube.com/embed/wJ1dejAGjZU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on examples of timer function in industrial application Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 34	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the programming of timers and mechanical timing relay b. Illustrate the different type of timers and mechanical timing relay
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask based on timers - Ask student to explain the need of timers - Ask question on mechanical relay - Ask student for signalling conditioning timers - Ask question the difference between timers and mechanical timing relay 2. Development (30 minutes) a. Explain the basic concept of timers b. instruction set for timer, working description of timers, may be input or output c. Explanation of done bit, preset value and accumulated/actual value d. controlling some hardware by operation by timers e. Explanation of mechanical timing relay f. Signal conditioning for mechanical timing relay 3. Exercise (5 minutes) – - Ask students to explain the idea of timer and relay - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
	Use Nearpod to collect responses and discuss the answers.



Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work write notes on different types of mechanical relay Suggested Video lecture https:// https://youtu.be/oxMdDsud5vg Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on programming based on timer, preset value, actual value calculation of different types of timer Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 35	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the retentive timer & cascading timers b. Illustrate the examples of timer function industrial application
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on timer & retentive timer - Ask student to explain the retentive timer - Ask question why retentive timer is used - Ask question based on cascading timers - Ask question based on cascading timers which is used in industry 2. Development (30 minutes) a. Explain the difference between timer & retentive timer b. Explain the retentive timer c. Explanation cascading timers & its physical significance d. Explain the programming retentive timer by using GX works2/ GX works3 e. Explain cascading timers f. Practice for programming of cascading timers 3. Exercise (5 minutes) – - Ask students to explain the difference between timer & retentive timer - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit



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	Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for difference between timer & retentive timer 3. Suggested Video lecture https:// https://www.youtube.com/embed/wJ1dejAGjZU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on examples of timer function in industrial application Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 36	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the timer instructions, ON delay timer instruction, Off-delay timer instruction b. Illustrate the types of timer & its operation
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions based on timers - Ask student to explain the type of timer - Ask question based on low speed, high speed & very high speed of timer - Ask question based on ON delay timer instruction, Off-delay timer instruction 2. Development (30 minutes) a. Explain the timers in details b. Explain the low speed, high speed & very high speed of timer c. Explanation accumulator value, preset value & done bit of low speed, high speed & very high speed of timer d. Explain the programming of low speed, high speed & very high speed of timer by using GX works2/ GX works3 e. Explain ON delay timer instruction and Off-delay timer instruction f. Programming of -ON delay timer instruction, Off-delay timer instruction using GX works3 3. Exercise (5 minutes) – - Ask students to explain low speed, high speed & very high speed of timer



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	- Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Home work for accumulator value, preset value & done bit of low speed, high speed & very high speed of timer 3. Suggested Video lecture https:// https://www.youtube.com/embed/wJ1dejAGjZU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on accumulator value, preset value & done bit of low speed, high speed & very high speed of timer Spend 5 minutes to evaluate student assimilation of the lesson contents



Lesson Plan No. 37	Course Name: Introduction to PLC & SCADA	Course No.: ECE-403
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Objectives	At the end of the lesson the student shall be able to: a. Understand the networking PLC b. Understand the wired communication in PLC c. Illustrate the shielded twisted pair communication in PLC d. Illustrate the Unshielded Twisted pair communication in PLC
Teaching Aids (if any)	a. PPT b. Chalk & talk and board c. Use of Nearpod tool for online quiz
Teaching Development	1. Introduction (5 minutes) - Recapitulation of previous lecture - Ask questions on networking PLC - Ask question on wired communication in PLC - Ask question about Unshielded Twisted pair communication in PLC 2. Development (30 minutes) a. Explain the networking in PLC a. Explain the serial & parallel communication in PLC b. Explain the master-slave communication in PLC c. Explain wired communication in PLC. c. Explain Unshielded Twisted pair communication in PLC 3. Exercise (5 minutes) – Ask students to explain the networking in PLC - Use Nearpod to collect responses and discuss the answers. - Quiz link - https://docs.google.com/forms/d/1A3n94xLwPnv15Zrex5vq0b8iI3wIurm-BxDBS2AizL0/edit
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these.



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	2. Home work on Unshielded Twisted pair communication in PLC 3. Suggested Video lecture https:// https://www.youtube.com/embed/kP_LnaYPKaM Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. . Nearpod Quiz on Unshielded Twisted pair communication in PLC Spend 5 minutes to evaluate student assimilation of the lesson contents