Bachelor of Science in Marine Engineering

INSTRUCTOR'S GUIDE

Course Title:	Basic Control Engineering	Date created: 20 March, 2019
Course Code:	Auto 1	
Effective Date:	xxxxxx	Revision No.: 0
Prepared by: Eng'rWenceslao M. Cawagas III MEP-MEM	Checked by: Eng'r Romano A. Gabrillo Adviser, Practicum Research Writing Eng'r Nancy M. Santiago Critic, Practicum Research Writing	Approved by:

By the end of this course, the students will be able to demonstrate knowledge, understanding and proficiency of the:

CO1: Differentiate basic construction and principles in automation regarding various measuring instruments and automation devices used onboard ships.

CO2: Interpret process and instrument diagrams of automation system based on the industry standards

CO3: Demonstrate performance test in accordance with the manufacturers standards for the: Monitoring systems; Automatic control devices; and Protective devices

WeekNo. Day No.	**TIME** 3 hrs.lec/ 3 hrs. lab	**UNITS/STEPS/AIDS**	**CONTENTS/ SUMMARY/ ACTIVITY**
W1-D1	1.5 hrs	Day 1 **General References:** ▪ STCW '78 Table AIII/1 Function: Electrical, Electronic and Control Engineering at the operational level ▪ CMO #67 series of 2017: Revised Policies, Standards and Guidelines for BSMT and	**The instructor shall introduce the subject to the class:** ▪ Present PPT 1:W1-D1Rationale Motivation; Grading System, Coverage; ▪ Discuss about grading system ▪ Discuss about the coverageof AUTO 1 ▪ Inform about weekly written exam and term

		BS Mar E programs ▪ CMO#14 series of 2018: Addendum to CMO #67series of 2017 **Teaching Aid/s:** PPT 1: W1-D1- contents: ▪ Motivation phase ▪ Grading ▪ Rationale ▪ Lesson proper***"Fundamentals of Automatic Control"*** **Textbooks:** ▪ T1: pp1- 10 **Video/s:** ▪ Video 1: Automation 6:20 min **References:** ▪ SR1: Control Fundamentals pp 9-18 **Websites:** ▪ W1: http://www.ent.mrt.ac.lk/~rohan/teaching/EN5001/Reading/DORFCH1.pdf	exams schedule ▪ Motivate the class about impact of automation to the shipping industry and to the world in general ▪ Play Video: Automation 6:20 min ▪ **Draw out** class interactions about the video ▪ Discuss lesson proper for W1-D1 "**Fundamentals of Automatic Control"** ▪ Entertain questions ▪ summarize the lesson of the day **The students shall:** ▪ ask questions and interact with discussions.
W1-D2	1.5 hours	Day 2 **Teaching Aid/s:** PPT 2: W1-D2 Component parts of automatic control **Video/s:** ▪ Video 2: Basics of Automation 2:09 min **Weekly Quiz:** ▪ Q #1 W1-D2 **References:** ▪ SR2: Control 101 pp 12-13 **Websites:** ▪ W2:	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 2:W1-D2 Component parts of automatic control ▪ Play video 2: Basics of Automation 2:09 min ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Give Q#1W1-D2 **Student shall:** ▪ answer the quiz.

		http://www.srmuniv.ac.in/sites/default/files/2018/Process-Control-Lab.pdf	
W1-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ Workshop Skills Activity Guide: ▪ WSA 01: Block Diagram of an Automatic Control System	**The instructor shall:** ▪ divide students into group, ▪ brief the students about the activity, ▪ remind the students about safety measures while on the workshop ▪ supervise activity proceedings ▪ debrief the students after the activity was performed. **The student shall:** ▪ read the manual procedure ▪ perform the activity. ▪ do housekeeping upon conclusion of activity
W2-D1	1.5 hours	Day 1 **Teaching Aid/s:** PPT 3:W2-D1- Control Methodology **Video/s:** ▪ Video 3: Feedback Control System 5:56 **References:** ▪ SR2: Control 101pp14-23, p47 **Websites:** ▪ W3: http://blog.opticontrols.com/archives/297	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 3:W2-D1:Control Methodology ▪ Play video 3: Feedback Control System 5:56 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson **The students shall:** ▪ ask questions and interact with discussions.
W2-D2	1.5 hours	Day 2 **Teaching Aid/s:** PPT 4:W2-D2- "Control Methodology" **Video/s:** ▪ Video 3: Feedback Control System 5:56 **Weekly Quiz:** ▪ Q#2 W2-D2 **References:** ▪ SR2: Control 101pp14-23, p47	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 4:W2-D2 contents: Control Methodology ▪ Play Video 3: Feedback Control System 5:56 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Give Q#2 W2-D2

		Websites: ▪ W4: http://www.shippipedia.com/ship-automation-control-system/	**Student shall:** ▪ answer the quiz
W2-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ Workshop Skills Activity Guide: ▪ WSA 02: Feedback Control System	**The instructor shall:** ▪ brief the students about the activity, what is expected outcome ▪ observe safety of the students during the proceedings ▪ debrief the students after the activity **The student shall:** ▪ read the procedure ▪ gather required materials/equipment ▪ perform the activity
W3-D1	1.5 hours	Day 1 **Teaching Aid/s:** PPT 5: W3-D1- On Off control **Video/s:** ▪ Video 5: Pressure Switch 3:49 **References:** ▪ SR1: Control Fundamentals p32 ▪ SR2: Control 101 pp 17-25 **Websites:** ▪ W5: https://www.coulton.com/What_is_On_Off_Control.html	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 5:W3-D1: On-Off Control ▪ Play video 5: Pressure Switch 3:49 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson **The students shall:** ▪ ask questions and interact with discussions.
W3-D2	1.5 hours	Day 2 **Teaching Aid/s:** A6:W3-D2- *"On-Off Control"* **Video/s:** ▪ Video 6: How to Adjust a Pressure Switch 7:57 ▪ Video 7: Hydrophore Unit1:22 **Weekly Quiz:** ▪ Q#3 W3-D2	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present A6:W3-D2 contents: On-Off Control ▪ Play Video 6: How to Adjust a Pressure Switch 7:57 ▪ Discuss about the video. ▪ Play Video 7: Hydrophore Unit 1:22 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson

		References: ▪ SR2: Control 101 p18	▪ Give Q#3 W3-D2 **Student shall:** ▪ Do the seatwork: Design an ON OFF Control system using a pressure switch with a cut in pressure of 4 bars and a cut out pressure of 5 bars ▪ answer the quiz
W3-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ Workshop Skills Activity Guide ▪ WSA 03: On-Off Control	**The instructor shall:** ▪ brief the students about the activity, what is expected outcome ▪ observe safety of the students during the proceedings ▪ debrief the students after the activity **The student shall:** ▪ read the procedure ▪ gather required materials/equipment ▪ perform the activity
W4-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 7: W4-D1*"Sequential Control"* **Video/s:** ▪ Video 8: Sequential Control of 3 motors 1:59 **Manuals:** ▪ M1: Machinery Operating Manual "HFS" pp10-21 **References:** ▪ R2: Control 101pp14-23, p47 **Websites:** ▪ W6: https://motor-control-circuits.blogspot.com/2015/03/sequential-control-3-stages.html	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 7:W4-D1: Sequential Control ▪ Play video 8: Sequential Control of 3 motors 1:59 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Remind about the prelim exam the following day ▪ Inform the students about the coverage of the exam **The students shall:** ▪ ask questions and interact with discussions. ▪ Study for the incoming prelim examination
W4-D2	1.5 hours	Day 2 **Prelim Examination:** ▪ Test Questionnaire	**The instructor shall:** ▪ prepare examination venue ▪ facilitate the conduct of the term exam **The student shall:**

			▪ answer Prelim Exam ▪ provide feedback to instructor for their learning progress of the course.
W4-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA 04: Sequential Control	**The instructor shall:** ▪ brief about safety precautions and discuss about the objectives of the activity **The student shall:** ▪ read the instructions on the manual ▪ perform the activity ▪ do housekeeping when the activity is concluded
W5-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 8:W5-D1- PID Control **Video/s:** ▪ Video 9: What is a PID Controller 5:38 **References:** ▪ SR2: pp26-35 **Websites:** ▪ W7: https://www.dataforth.com/introduction-to-pid-control.aspx	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 8:W5-D1: PID Control ▪ Play video 8: Sequential Control of 3 motors 1:59 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Remind students to study for weekly quiz **The students shall:** ▪ ask questions and interact with discussions.
W5-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ PPT 9:W5-D2**-** "PLC and PID Controller" **Video/s:** Video 10: Proportional Gain3:55 **Weekly Quiz:** ▪ Q#4 W5-D2 **References:** ▪ R2: Control 101pp14-23, p47 **Websites:**	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 9:W5-D2: PLC and PID Controller ▪ Play Video 10: Proportional Gain 3:55 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Give Q#4 W5-D2 **Student shall:** ▪ answer the quiz

		▪ W8: https://www.eurotherm.com/plc-or-pid-controller-whats-the-difference-and-how-do-you-decide-what-technology-you-need	
W5-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA 05: Performance Check of a PID Controller **Simulator:** ▪ S2: PID Simulator	**The instructor shall:** ▪ brief the students about the expected outcome of the activity ▪ remind safety matters ▪ answer questions about the activity ▪ debrief the students and appreciate those who performed well **The student shall:** ▪ read the procedure in the manual ▪ perform the activity
W6-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 10:W6-D1"Characteristics of PID Control" **Video/s:** ▪ Video 11: PIDs Simplified 13:06 **References:** ▪ SR2: pp 29-32	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 10:W6-D1: Characteristics of PID Control ▪ Play video 11: PIDs Simplified 13:06 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Remind students to study for weekly quiz **The students shall:** ▪ ask questions and interact with discussions
W6-D2	1.5 hours	Day 2 **Teaching Aid/s:** A11: W6-D2 "PID Controller Actions" **Video/s:** ▪ Video 12: Understanding PID in 4 Minutes 3:59 **Weekly Quiz:** ▪ Q#5 W6-D2	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present A11:W6-D2: PID Controller Actions ▪ Play Video 12: Understanding PID in 4 Minutes 3:59 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Give Q#5 W6-D2 **Student shall:**

			▪ answer the quiz
W6-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA 06: Controller Tuning **Simulator:** ▪ S2: PID Simulator	**The instructor shall:** ▪ Brief the students about what is expected in the activity ▪ Familiarize them with the use of the PID simulator ▪ Demonstrate operation of the simulator **The students shall:** ▪ Read the manual procedure ▪ perform the activity ▪ draw out realization on the PID tuning
W7-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 12:W7-D1"Temperature Measurement" **Video/s:** ▪ Video 13: How Bi-metallic Thermometer Work 6:20 **Textbook/s:** ▪ T1: pp11-12	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 12:W7-D1:Temperature Measurement ▪ Play video 13: How Bi-metallic Thermometer Work 6:20 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Remind students to study for weekly quiz **The students shall:** ▪ ask questions and interact with discussions
W7-D2	1.5 hours	**Teaching Aid/s:** ▪ PPT 13: W7-D2 "Mechanical Thermometers" **Video/s:** ▪ Video 14: How a Bulb Thermometer Works 4:05 **Weekly Quiz:** ▪ Q#6 W7-D2	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 13:W7-D2: Mechanical Thermometers ▪ Play Video 14: How a Bulb Thermometer Works 4:05 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Give Q#6 W7-D2 **Student shall:** ▪ answer the quiz
W7-D3	3 hours	Day 3	**The instructor shall:**

		Teaching Aid/s: ▪ WSA 07: Performance Test of a Pt100 Sensor ▪ WSA 08: Calibration of a Pt100 Transmitter **Manual:** ▪ M3: Pt100 Resistance Table ▪ M8: Fluke 724 Manual	▪ brief the students about the expected outcome of the activity ▪ remind safety measures ▪ debrief the students about their results ▪ reconcile different issues about the result **The students shall:** ▪ read the manual procedure ▪ perform the activity 07 and 08 ▪ observe safety practice at all times ▪ do the housekeeping after the activity is concluded
W8-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 14: W8-D1 "Electrical Thermometers" **Video/s:** ▪ Video 15: Types of Temperature Sensors 4:27 **Textbook/s:** ▪ T1: pp13-21 **Websites:** ▪ W9: http://www.instrumentationtoday.com/optical-pyrometer/2011/08/	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 14:W8-D1:Temperature Measurement ▪ Play video 15: Types of Temperature Sensors 4:27 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Remind students to study for the midterm exam **The students shall:** ▪ ask questions and interact with discussions
W8-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ Test Questionnaire ▪ Midterm Exam	**The instructor shall:** ▪ prepare examination venue ▪ facilitate the conduct of the term exam **The student shall:** ▪ provide feedback to instructor for the learning progress of the course. ▪ answer Midterm Exam
W8-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA 09: Performance Test of a TC "K" sensor ▪ WSA 10: Calibration of a TC" K" Transmitter	**The instructor shall:** ▪ Brief the student about the activity ▪ Remind the students about safety practice ▪ Reconcile any arguments about the result of the activity ▪ Appreciate those students who are outstanding in their

		Manual: ▪ M4: Type K thermocouple reference table ▪ M8: Fluke 724 Manual	result **The student shall:** ▪ Read the manual procedure ▪ Perform Activity ▪ Do housekeeping upon conclusion of the activity
W9-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 15: W9-D1 “Pressure Measurement” **Video/s:** ▪ Video 16: How Fluid Pressure is measured 11:10 **Textbook/s:** ▪ T1: pp23-32 **Websites:** ▪ W10: https://en.wikipedia.org/wiki/Pressure_measurement	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 15:W9-D1:“Pressure Measurement” ▪ Play video 16: How Fluid Pressure is Measured 11:10 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day’s lesson ▪ Remind students to study for weekly quiz **The students shall:** ▪ ask questions and interact with discussions
W9-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ PPT 16: W9-2 “Bourdon Tubes” **Video/s:** ▪ Video 17: How a Bourdon Pressure Gauge Work 7:33 **Weekly Quiz:** ▪ #7 W9-D2 **Websites:** ▪ W11: https://blog.beamex.com/how-to-calibrate-pressure-gauges	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 16:W9-D2: Bourdon Tubes ▪ Play Video 17: How a Bourdon Pressure Gauge Work 7:33 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day’s lesson ▪ Give Q #7 W9-D2 **Student shall:** ▪ answer the quiz
W9-D3	3 hours	Day 3 **Teaching Aid/s:**	**The instructor shall:** ▪ Brief the students about the intended outcome of the activity

		▪ WSA 11 Performance Test of a Pressure Switch ▪ M5: RT116 Nomogram	▪ Remind safety measures ▪ Debrief by explaining about the outcome of the activity ▪ Appreciate those group who are outstanding in performance **The student shall:** ▪ Read the instruction manual ▪ Ask clarificatory questions ▪ perform the activity ▪ do housekeeping after the conclusion of the activity
W10-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 17 W10-D1 Level Measurement-Direct **Video/s:** ▪ Video 18: Ball Float Liquid Level Sensor 4:20 **Textbook/s:** ▪ T1: pp. 33-34 **Websites:** ▪ W12: http://aboutinstrumentation.blogspot.com/2012/02/level-measurement-direct-methods.html	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 17:W10-D1:Level Measurement-Direct ▪ Play video 18: Ball Float Liquid Level Sensor 4:20 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Remind students to study for weekly quiz **The students shall:** ▪ ask questions and interact with discussions
W10-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ PPT 18: W10-D2 "Level Measurement-Inferential" **Video/s:** ▪ Video 19: Level measurement using DP Transmitter6:14 **Weekly Quiz:** ▪ Q#8 W10-D2 **Textbook/s:**	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 18:W10-D2: Level Measurement-Inferential ▪ Play Video 19: Level measurement using DP Transmitter6:14 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Give Q#8 W10-D2

		▪ T1: pp 35-39 **Websites:** ▪ W13: https://paktechpoint.com/indirect-level-measurement-methods-paktechpoint/	**Student shall:** ▪ answer the quiz
W10-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA12: Performance test of a Float Switch	**The instructor shall:** ▪ Brief the student about the activity ▪ Remind safety practice ▪ Process the results of the activity **The student shall:** ▪ Read the manual procedure ▪ Clarify unclear instructions ▪ perform activity ▪ do housekeeping at the end of activity
W11-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 19: W11-D1 “Flow Measurement” **Video/s:** ▪ Video 20: Differential Pressure Flow Measurement (Venturi) 4:49 ▪ Video 21: DP Flow measurement (Pitot) 4:36 **Textbook/s:** ▪ T1: pp41-47 **Websites:** ▪ W14: https://en.wikipedia.org/wiki/Flow_measurement	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 19:W11-D1: Flow Measurement ▪ Play Video 20: Differential Pressure Flow Measurement (Venturi) 4:49 ▪ Discuss about the video. ▪ Video 21: DP Flow measurement (Pitot) 4:36 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day’s lesson ▪ Remind students to study for weekly quiz **The students shall:** ▪ ask questions and interact with discussions

W11-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ PPT 20: W11-D2 “Flow Measurement contd.” **Video/s:** ▪ Video 22: Rotameter Working Principle 3:24 **Weekly Quiz:** ▪ Q#9 W11-D2 **Textbook/s:** ▪ T1: p47-54 **Websites:** ▪ W15: https://en.wikipedia.org/wiki/Rotameter	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 20:W11-D2: Flow Measurement contd. ▪ Play Video 22: Rotameter Working Principle 3:24 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day’s lesson ▪ Give Q#9 W11-D2 **Student shall:** ▪ answer the quiz
W11-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA 13: Performance Test of a DP Transmitter **Manual:** ▪ M7: 1151 Rosemount Pressure Transmitter	**The instructor shall:** ▪ brief the students about the activity and its expected outcome ▪ remind safety precautions to themselves and to the equipment ▪ debrief the students after the conduction of activity and clarify the results **The student shall:** ▪ Read the manual procedure ▪ perform the activity ▪ observe safety at all times
W12-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 21: W12-D1 “General Measurement of Process” **Video/s:** ▪ Video 23: Inductive Type RPM sensor 5:39 **Textbook/s:** ▪ T1: pp 55-59 **Websites:**	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 21:W12-D1:“General Measurement of Process” ▪ Play Video 23:Inductive Type RPM sensor 5:39 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day’s lesson ▪ Remind students to study for weekly quiz **The students shall:**

		▪ W16: https://www.marineinsight.com/main-engine/how-to-prevent-crankcase-explosion-on-a-ship/	▪ ask questions and interact with discussions
W12-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ Semi Final Examination	**The instructor shall:** ▪ prepare examination venue ▪ facilitate the conduct of the term exam **The student shall:** ▪ provide feedback to instructor for the learning progress of the course ▪ answer Semi-final Exam
W12-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA 14: Boiler Flame Scanner (Photocell)	**The instructor shall**: ▪ Brief the students about the activity ▪ Remind safety precaution ▪ Debrief the students after the activity **The student shall** ▪ Read the manual procedure ▪ perform the activity ▪ do housekeeping upon conclusion of the activity
W13-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 22: W13-D1 General Measurement of Process contd. **Video/s:** ▪ Video 24: Vibration Monitor 16:27 **Textbook/s:** ▪ T1: pp 60-74	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 22:W13-D1:General Measurement of Process contd. ▪ Play Video 24:Vibration Monitor 16:27 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Remind students to study for weekly quiz **The students shall:** ▪ ask questions and interact with discussions
W13-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ PPT 23: W13-D2Transmitters **Video/s:** ▪ Video 25: Open tank Level Measurement 17:29	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 23:W13-D2: Transmitters ▪ Play Video 25: Open tank Level Measurement 17:29

		▪ Video 26: Why 4 to 20 mA 3:38 **Weekly Quiz:** ▪ Q#10 W13-D2 **References:** ▪ SR2:Control101pp 4-7 **Websites:** ▪ W17:https://www.instrumentationtoolbox.com/2013/06/transmitters-used-in-process.html	▪ Discuss about the video. ▪ Play Video 26: Why 4 to 20 mA 3:38 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Give Q#10 W13-D2 **Student shall:** ▪ answer the quiz
W13-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA 15: Performance test of a Pneumatic transmitter **Manual:** ▪ M6: Nomogram of Foxboro 11GM	**The instructor shall:** ▪ Brief the students about the activity ▪ Emphasize care for the pneumatic transmitter's delicate components ▪ Remind safety protocols while at the laboratory ▪ Summarize the entire activity based from their gathered data **The student shall:** ▪ Read manual procedure ▪ Prepare for equipment needed ▪ perform the activity ▪ do housekeeping upon conclusion of the activity
W14-D1	1.5 hours	Day 1 **Teaching Aid/s:** PPT 24: W14-D1Pneumatic Controlling Elements **Video/s:** ▪ Video 27: 3 Basic Mechanism for Pneumatic 4:40 **Textbook/s:** ▪ T1: pp 76-78	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 24:W14-D1:General Measurement of Process contd. ▪ Play Video 27:3 Basic Mechanism for Pneumatic 4:40 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Remind students to study for weekly quiz

			The students shall: ▪ ask questions and interact with discussions
W14-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ PPT 25: W14-D2 Receivers **Video/s:** ▪ Video 28: How Servomotors Work 2:27 **Weekly Quiz:** ▪ Q#11 W14-D2 **Textbook/s:** ▪ T1: pp 84-88 **Websites:** ▪ W18: https://en.wikipedia.org/wiki/Chart_recorder	The instructor shall: ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 25:W14-D2: Receivers ▪ Play Video 28: How Servomotors Work 2:27 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Give Q #11 W14-D2 **Student shall:** ▪ answer the quiz
W14-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA 16: AC and DC Servomotors	**The instructor shall:** ▪ Brief the students about the expected outcome of the activity ▪ Debrief the students after the activity **The student shall:** ▪ Read the manual procedure ▪ perform activity ▪ do housekeeping upon conclusion of the activity
W15-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 26: W15-D1 Pneumatic Manipulating Element **Video/s:** ▪ Video 29: Control Valves 1:41 ▪ Video 30: How Diaphragm Control valve works 5:28 **Textbook/s:** ▪ T1: pp 115-118 **Websites:** ▪ W19:	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 26: W15-D1: General Measurement of Process contd. ▪ Play Video 29: Control Valves 1:41 ▪ Discuss about the video. ▪ Play Video 30: How Diaphragm Control valve works 5:28 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson

		https://en.wikipedia.org/wiki/Pneumatic_actuator	▪ Remind students to study for weekly quiz **The students shall:** ▪ ask questions and interact with discussions
W15-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ PPT 27: W15-D2 Valve Positioner **Video/s:** ▪ Video 31: What are valve positioners 3:41 ▪ Video 32: Calibration of a Positioner 11:28 **Weekly Quiz:** ▪ Q #12 W15-D2 **Textbook/s:** ▪ T1: pp 117-120	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 27:W15-D2: Valve Positioner ▪ Play Video 31: What are valve positioners 3:41 ▪ Discuss about the video ▪ Play Video 32: Calibration of a Positioner 11:28 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Give Q #12 W15-D2 **The Student shall:** ▪ answer the quiz
W15-D3	3 hours	Day 3 **Teaching Aid/s:** WSA 17: Diaphragm Operated Control Valve	**The instructor shall:** ▪ Brief the students about the expected outcome of the activity ▪ Debrief the students after the activity **The student shall:** ▪ Read the manual procedure ▪ perform activity ▪ do housekeeping upon conclusion of the activity
W16-D1	1.5 hours	Day 1 **Teaching Aid/s:** ▪ PPT 28: W16-D1 Electrical Servomotors **Video/s:** ▪ Video 33: Swash Plate Pump 5:27 **Textbook/s:** ▪ T1: pp121-126 **Websites:**	**The instructor shall:** ▪ recall previous topic to the class ▪ discuss lesson proper for the day. ▪ Present PPT 28: W16-D1: Electrical Servomotors ▪ Play Video 33: Swash Plate Pump 5:27 ▪ Discuss about the video. ▪ Entertain questions from the students ▪ Summarize the day's lesson ▪ Remind students to study for final exam **The students shall:**

		▪ W20: https://www.watelectrical.com/servo-motor-types-and-working-principle/	▪ ask questions and interact with discussions
W16-D2	1.5 hours	Day 2 **Teaching Aid/s:** ▪ Final Examination Questionnaire	The instructor shall: ▪ prepare the room for examination ▪ facilitate the conduct of the Final Examination The student shall: ▪ answer the Written Final Examination ▪ provide feedback to instructor for the learning progress of the course
W16-D3	3 hours	Day 3 **Teaching Aid/s:** ▪ WSA 18 Compilationof WSA ▪ Final Practical Assessment #1 for set A ▪ Final Practical Assessment #2 for set B	**The instructor shall:** ▪ Collect compilation of activities ▪ Summarize the entire subject of automation what did they learn and the essence of automation in their future work ▪ Prepare for Final Practical Assessment ▪ Brief the students about the rules of the assessment ▪ Conduct Individual Final Practical Assessment
			END