



Integrated Manufacturing Systems Troubleshooting

Troubleshooting Capstone: Course Structure

Course Delivery Information

The following is provided to give the students attending the troubleshooting capstone an idea of how the class will flow.

The class will run from 80 to 120 hours. It is competency based; therefore, it is probable that the more proficient students will not require the full 120 hours to complete. The course counts for one credit hour.

The students will be provided a series of exercises to complete. Some of these exercises will take considerable time to finish. All assigned exercises will have to be completed. (Refer to the attached rubric.)

While working on the exercises, the students will be rotating through troubleshooting labs on the AMTEC and SMC Trainers. The students will have a series of labs to finish in this course.

Each day (once we get passed the first 2 days) there will be a daily mini lecture on material that we feel needs to be enhanced or new material that was not covered in your program of study.

A grading rubric will be completed for each student and will be passed on to the employers. (MAT2 only) The course objectives and rubric will be covered on the first day of class.

Many of the exercises and labs will be made available in the form of files from a flash drive on the first day of class to allow you to proceed at your own speed.

Course Topic Outline

Topic 1: Course Introduction – Reference Flash drive contents

- Course objectives
- Rubric
- Review contents of Flash drive
- Tracking sheet

Topic 2: Sequence Diagrams – Lecture and Handouts

- Purpose
- Standard Form
- Exercise on developing
- Discussion on how to develop
- Junction Box remote I/O addressing
- Q&A





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Topic 3: Machine overviews

- Demonstration on the operation of the SMC and AMTEC Trainers
- Automatic and Manual modes

Topic 4: Print reading exercise issued – completed and discussed (Hard copies from the instructor)

- Must be checked off by instructor

Exercise _____

Topic 5: System Familiarity Lab (Reference flash drive masters - Sequence Diagram Labs Part 1 and 2)

- Students working on the AMTEC System and specified SMC stations to become familiar with the Power-up, Operation and HMI screens – on the trainers
- Students start documentation for the sequence diagrams

Topic 6: Introduction to troubleshooting Part 1 – with Logic

- Lecture
- Exercises - version 1 – hard copies (Written)
- Exercises must be checked off by instructor

Exercise _____

Topic 7: Sequence Diagram Lab Part 1 and 2 (Continuation)

- All students must rotate through the AMTEC Trainer
- All student should have completed at least one station on the SMC

Topic 8: Logic analysis

- Logic Analysis Exercises reference AMTEC PLC Logic Analysis 1 and 2
- Student must submit Logic Exercises to Instructor for check-off
- Discussion and Q&A

Complete _____





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Topic 9: Introduction to troubleshooting Part 2 – without Logic

- Lecture
- Exercises Version 1 – Hard copies
- Exercises must be checked off by instructor Complete _____

Note: The troubleshooting Methodology will be reviewed several days – usually at the start of class and it will be expanded on each day.

Topic 10: Labs

- Continuation of the development of the sequence Diagrams and Logic Analysis
- Troubleshooting labs – Level one faults
- Sequence Diagram with permissives – Reference Flash drive contents
- Insure that the instructor marks off the lab completion sheet for each troubleshooting lab completed

Permissives reflected on the Sequence Diagram _____

Troubleshooting labs complete _____

Topic 11: Studio 5000

- Use in determining actual triggers
- Demo by Instructor

Topic 12: Robot to PLC Interfacing

- Lab and PLC to Robot Interfacing Lab/exercise
- Submit the spreadsheet to the instructor Complete _____

Topic 13: Remote I/O

- Issue Exercise
 - Student complete exercise and submit to instructor
- Exercise complete _____

- When all students are complete, there will be a Class Discussion
- Q&A





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Topic 14: Troubleshooting exercises Version 2

- Issued hardcopies
- Students complete and submit to instructor

Exercise complete _____

Topic 15: Lab Troubleshooting Level 2 and 3 faults

Complete _____

Note: Students will have to reference the Manufacturers Information supplied on the flash drive for the level 3 faults. The instructor will assign the station and the faults for the “Faults crossing Shifts.”

Note: After the first 2 days the majority of time will be spent in lab, completing the troubleshooting exercises and finalizing the sequence diagrams with verified triggers and permissives.

Topic 16: Arc Flash

- Lecture
- PPE

Topic 17: Safety Circuits and hardware overview

- Lecture on principles
- Students issued Safety exercise – Hard copy
- Reference the provided Manufacturers Literature. – Flash Drive
- All students to complete and submit to the instructor
- Discussion of exercise
- Lecture on A/B Safety Partners and Guard Logic

Complete _____

Topic 18: System Optimization labs – Reference Flash drive

- Instructor to select Labs and stations
- Students to complete

Complete _____





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Topic 19: Application of analog I/O

- Mini Lecture
- Lab
- Note this topic is at the discretion of the instructor Complete _____

Note: The final sequence diagram on the AMTEC Trainer and selected SMC Stations must be submitted to the instructor
Complete _____

Note: The students will be back-logged in lab. When not troubleshooting, the students are expected to complete the assigned exercises and submit to the instructor. The Labs will not necessarily be completed in the order reflected here. The instructor may want to assign different levels of faults to different students to minimize the student to student exchange of information regarding the labs.

Note: The complete Check lines at the right side of the above may represent numerous labs are being completed.
(Reference the attached rubric.)





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