

Syllabus

Course No.:	PPT 225-001
Course Name:	Plant Investigation and Troubleshooting Lecture
Semester:	Spring 2021
Credits:	2
Class Meetings:	B036: M, W 10:20-11:20
Instructor:	Andrew D. Sullivan
Phone:	247-3047
Email:	Andrew.Sullivan3@msubillings.edu
Faculty Website:	http://www.msubillings.edu/cotfaculty/sullivan/
Office:	A061 – Tech Building
Office Hours:	See attached schedule

Required Texts and Material:

There are no required textbooks to purchase. Required materials will be posted on D2L.

Course Description:

Provides the student with an overview of the various troubleshooting models used by process technicians. Process troubleshooting involves different types of troubleshooting techniques, procedures, and methods used to solve process problems. Topics include application of data collection and analysis, cause-effect relationships, and reasoning. The student is exposed to many different trouble situations like those encountered in the process plant experience. The student is taught a systematic way to solve problems, using measured process variables and personal knowledge of how they affect each other (cause and effect).

Course Goals and Objectives:

Upon completing this unit, students will be able to:

1. Analyze how equipment and instrument malfunctions affect a system.
2. Evaluate how a malfunction in one system will affect other systems.
3. Detect problems using monitoring equipment, data from a plant historian, and specially collected data. Analyze a problem's potential consequences and communicate the situation effectively to the proper authorities.
4. Develop a prioritized list of possible causes or theories for abnormal operations using troubleshooting methods for a wide range of scenarios. Develop and implement plans to test hypotheses by collecting data and reconciling it to troubleshooting theories. Interpret the data and judge if the data supports or refutes a theory, and modify the theory as needed. Determine the root cause and develop corrective actions for the short, medium, and long term.

Academic Issues and Grading:

- Late work is not accepted.
- Final lecture grades will be calculated per the following scoring criteria:

Tests (average of 3 evenly split)	80%
Assignments	20%

- Grade Scale:

Grade	Percentage	GPA		Grade	Percentage	GPA
A	93 - 100	4.0		C	73 - 77	2.0
A-	90 - 93	3.7		C-	70 - 73	1.7
B+	87 - 90	3.3		D+	67 - 70	1.3
B	83 - 87	3.0		D	63 - 67	1.0
B-	80 - 83	2.7		D-	60 - 63	0.7
C+	77 - 80	2.3		F	0 - 60	0.0

Course Outline:

The following plan is a guideline that will be adjusted to meet the needs of the class.

Week	Day	Class	Class Topic / Plan
1	Wed 01/13	1	What is troubleshooting
2	Mon 01/18		Martin Luther King Day NO CLASSES OFFICES CLOSED
	Wed 01/20	2	Case Study: Low flow from a drum
3	Mon 01/25	3	Foundations of Process Control
	Wed 01/27	4	Identifying root causes Case Study: Mix and flash
4	Mon 02/01	5	Case Study Distillation and Furnaces
	Wed 02/03	6	Temperature indicators, transmitters, and TI guns
5	Mon 02/08	7	Gauges and Transmitters for Pressure, Flow, and Level Measure
	Wed 02/10	8	Test #1
6	Mon 02/15		Presidents' Day NO CLASSES OFFICES CLOSED
	Wed 02/17	9	Level transmitters, 3-phase drums, unusual control schemes Case Study: Sponge oil level questions
7	Mon 02/22	10	Case Study: Response to plugged taps
	Wed 02/24	11	Oscillating systems (positioners and position sensors) Case Study: Taking a positioner out of service Case Study: Finding the instrument causing cycling
8	Mon 03/01	12	Valves - Safety, Control, Check, Block, Globe. Case Study: CV not opened all the way Case Study: Stuck valve around slurry controller
	Wed 03/03	13	Trouble establishing flow Case Study: How to safely clear a line Case Study: Wash oil level blow through pressuring up SWS line
9	Mon 03/08	14	Winterization Case Study: Frozen sour water lines with electric tracing Case Study: How to prevent freeze-ups
	Wed 03/10	15	Pumps Case Study: Pumping issues in a system

			Case Study: Double seal leaking pressurization gas Case Study: Stuck check valves blowing back to SW tank
10	Mon 03/15	16	Test #2
	Wed 03/17	17	Heat Exchangers Case Study: Limed up water cooler Case Study: Fouled thermosiphon reboiler
11	Mon 03/22	18	Case Study: How to find a plugged parallel exchanger Case Study: Steam hammer on startup Case Study: Leaking diesel rundown cooler
	Wed 03/24	19	Distillation Towers Case Study: Fouled SWS trays Case Study: Foaming
12	Mon 03/29	20	Multi-Draw Distillation Towers Case Study: Plugged downcomer Case Study: Damaged trays
	Wed 03/31	21	Furnaces Case Study: Control system response on trip Case Study: Importance of procedures during a startup
13	Mon 04/05	22	Compressors Case Study: Lineup issues cause a false start Case Study: The importance of a robust procedure system
	Wed 04/07	23	Merox units Case Study: Troubleshooting is finding what's different Case Study: High LPG sulfur from contaminated crudes
14	Mon 04/12	24	Amine units Case Study: High heat stable salts
	Wed 04/14	25	Case Study: High Particulates Case Study: Improper filter change out
15	Mon 04/19		Final Exam 10:00 am - 12:00 pm

Safety:

Some hazards can't be eliminated in a process plant or academic setting and must be managed to prevent serious injury. A discussion of hazards and how to mitigate them will be part of lectures, labs, and other activities and will include safety equipment checks, personal protective equipment requirements, and training. Student responsibilities include:

- Be fully engaged so you understand the hazards and are prepared to manage them.
- Be in a suitable physical and mental state to perform safely and determine if you are prepared to engage in an activity.
- Wear all required PPE. Safety glasses are always required in the lab. No open-toe shoes are allowed in the lab.
- Perform safely and professionally. Horseplay gets people hurt.
- Follow all rules and procedures.

Failure to follow safety rules may result in a written warning, a failing grade for the assignment or course, or loss of laboratory / activity privileges to protect other students. MSUB is not responsible for injury resulting from failure to follow rules or procedures.

Access, Assistance, and Advocacy:

A summary of services to help you succeed in a positive, supportive, and enjoyable learning environment is listed below.

- [Academic Support Center](#). The City College branch is open M-F 9-5. Resources include tutoring and a writing center. Drop-in and by appointment. 247-3022.
- [Disability Support Services \(DSS\)](#). MSU Billings is committed to providing equal access. Please meet with me to discuss ways to ensure your full participation if you anticipate barriers. DSS will help us (247-3029, Tech Building A011).
- [TRIO/Student Support Services](#). Support for low income, first generation, and disabled students enrolled in a 4-year program (or 2+2 at City College). 657-2162
- [Native American Achievement Center](#). Advocacy and assistance for American Indian students. 657-2144
- [Student Health Services](#). Student Health Services provides medical care, mental health counseling, wellness services and education, and violence advocacy and prevention services. Located above the Academic Support Center at City College. Students can use Health Services even if they waive the student health insurance plan. 657-2153
- [Veterans Services](#). For assistance activating your VA Educational Benefits, getting access to VA assistance for tutors, or even joining the veteran student organization, contact the VA Representative in the Military and Veterans Success Center at 657-2982. For assistance on the posting of your VA Educational benefits please contact the Business Services office at 657-1707.
- [Veterans Upward Bound](#). Assistance for veterans from admission to graduation. 657-2075

Class and Lab Policies:

- We will follow all rules and guidance set by the University.
- Academic or personal misconduct will be managed per the procedures outlined in the [MSU Billings Student Policies & Procedures Handbook](#).
- Phones, computers, and tablets are not allowed in class.
- Food and drinks are not allowed in classrooms or labs.
- Disruptive behaviors will result in final grade reductions up to 10% per occurrence.

Andy Sullivan's Spring 2021 Calendar

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00-9:00	PPT 211	PPT 212	PPT 211		
9:10-10:10	Office Hours		Office Hours		PPT 176
10:20-11:20	PPT 225	Office Hours	PPT 225		
11:30-12:30	Lunch	Lunch	Lunch	Lunch	Lunch
12:40-1:40	PPT 120	PPT 161	PPT 120	PPT 161	PPT 176
1:50-2:50	PPT 175	PPT 175	PPT 175	PPT 175	
3:00-4:00	PPT 212			Office Hours	
4:10-5:10					