SOUTHEAST COMMUNITY COLLEGE
CONSTRUCTION MANUFACTURING AND TECHNOLOGY DIVISION
Energy Generation Operations Technology Program
Revision Date: August 26, 2019
Syllabus Statements

I. CATALOG DESCRIPTION

Course Number:	ENER2300
Course Title	Coal Plant Operations and Troubleshooting
Prerequisite(s):	ENER2120
Catalog Description:	Introduction to the general layout and system operations of a typical coal-fueled electric generating plant. Coal-handling systems, emission controls, life-cycle parts monitoring, combustion controls, fire systems, steam, water, air systems and general operations of a coal plant are covered. Troubleshooting scenarios are introduced and practiced. Lab must be taken concurrently.
Credit Hours:	3
Class Hours:	38
Lab Hours:	23
Total Contact Hours:	61

II. COURSE OBJECTIVES: *Course will*

A. Introduce the students to the equipment and systems that are used to handle the fuel in a coal-fired electricity generating plant.
B. Provide theory for and examples of auxiliary systems in a typical coal-fired power plant.
C. Outline the various condensate and feedwater systems used in a typical coal-fired power plant.
D. Describe and outline the various air systems utilized in a typical coal-fired power plant.
E. Describe the steam-generating systems in a typical coal-fired power plant.
F. Explain how emission control systems work in a typical coal-fired power plant and why they are necessary.
G. Describe a typical electrical flow diagram for a common coal-fired power plant.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

A. Student Learning Outcomes: *Student will be able to*
1. Describe the overall operation of a typical coal-fired power plant.
2. Describe the fundamental operation of coal-fired power plant equipment.
3. Explain the characteristics of Powder River Basin coal.
4. Describe the coal delivery system for a coal-fired power plant.
5. Describe the boiler and air system relationships in a coal-fired power plant.
6. Explain the operational relationships of the circulating water, condensate & feedwater systems in a coal-fired power plant.
7. Explain and draw the steam system from the boiler to the condenser in a coal-fired power plant.
8. Describe the auxiliary systems in a common coal-fired power plant.
9. Sketch and describe the electrical distribution systems and equipment.
10. Explain the significance of the coal-fired power plant environmental systems & controls.

B. General Education Learning Outcomes (GELOs)
1. GELO #3: Critical Thinking & Problem Solving

Outcome 2: Synthesize information to arrive at reasoned solutions to problems.

IV. CONTENT/TOPICAL OUTLINE

- **A.** Conventional coal-fired Power Plant Primary Systems
  - **1.** Typical coal-fired power plant primary systems
  - **2.** Coal-fired Power Plant System Inter-relationships
- **B.** Coal Delivery & Handling systems
  - **1.** Coal Types and Sources
  - **2.** Coal Delivery Methods
  - **3.** Outside Coal Handling Systems
    - **a.** Stacking and Reclaiming Systems
    - **b.** Conveyors
  - **4.** Inside Coal Handling Systems
    - **a.** Conveyors
    - **b.** Trippers
    - **c.** Coal Silos
    - **d.** Coal Feeders
    - **e.** Coal Pulverizers (Mills)
    - **f.** Coal Burners
- **C.** Auxiliary Systems
  - **1.** Lube Oil Supply and Transfer Systems
  - **2.** Station Compressed Air Systems
  - **3.** Auxiliary Boilers
  - **4.** Drains and Sumps
  - **5.** Hydraulic Control Systems
  - **6.** Turning Gear Systems
  - **7.** Seal Oil Systems
  - **8.** Steam Seal Systems
  - **9.** Generator Hydrogen Cooling System
- **D.** Water Systems & Equipment
  - **1.** Circulating Water Systems
  - **2.** Condensate Water Systems
  - **3.** Feedwater Systems
  - **4.** Pumps and Valves
  - **5.** Pre-Heaters
  - **6.** Cooling Towers and River Systems
- **E.** Air Handling Systems
  - **1.** Primary Air Systems
  - **2.** Secondary (Combustion) Air Systems
  - **3.** Tertiary Air Systems
  - **4.** Forced Draft (FD) Blowers
  - **5.** Induced Draft (ID) Blowers
  - **6.** Balanced Draft Systems
- **F.** Steam Systems
  - **1.** High Pressure Boiler Construction
  - **2.** Steam Drums
  - **3.** Steam System Safety
  - **4.** Downcomers
  - **5.** Superheaters
  - **6.** De-Superheaters (Attemperators)

7. Extraction Steam
8. Steam Turbines
9. Hydraulic Controlled Steam Valves
    a. Stop Valves
    b. Throttle Valves
    c. Governor Valve

G. Emission Control Systems
1. SO2, NOx, Mercury, Co2 and Particulate Controls
2. Fabric Filters (Baghouses)
3. Electrostatic Precipitators
4. SCR (Selective Catalytic Reduction) Systems
5. SDA (Spray Dry Absorber) Systems
6. Activated Carbon Injection Systems
7. Bottom Ash Systems
8. Fly Ash Systems
9. EPA Requirements

H. Electrical Systems
1. Generators
2. Transformers
3. Emergency and Backup Power Systems
4. Plant House Electrical Systems
    a. 480 Volt Systems
    b. 4160 Volt Systems
    c. 13.8kvolt Systems
    d. DC Systems
5. Motor Control Centers (MCC)

V. INSTRUCTIONAL MATERIALS

A. Required Text(s): Howlett, II, H. C., *The Industrial Operators Handbook*, Thomas, Charles E., *Process Technology Equipment & Systems*, 4th Edition, ISBN-13: 978-1-4354-9912-6 and online reading materials
B. Other Resources: Plant visits and the Internet
C. Outside Reading/Research required: Internet Research assignments as assigned
D. Supplies: As assigned

VI. METHODS OF PRESENTATION/INSTRUCTION

A. Methods of presentation typically include a combination of the following:
1. Hybrid class

VII. METHODS OF EVALUATION

A. Methods of evaluation, although determined by the individual instructor, traditionally includes a combination of the following:
1. Class participation
2. Regular assignments
3. Written exams and/or quizzes
4. Performance and observational assessments

VIII. SPECIFIC COURSE REQUIREMENTS

A. A minimum grade of “C” or 70% is required to receive credit for this course.

B. **Cheating within the Manufacturing Division:** Any violation of academic integrity on assignments, quizzes, or tests will result in a grade of 0 on that assignment, quiz, or test. A second violation in any course after the initial infraction will result in a grade of F for that course. Any additional violations while in the program will result in a suspension from the program. For additional information, refer to the *Academic Integrity* pamphlet available from Student Services.

C. **Credit by Examination:** Credit for the course CANNOT be earned through Credit by Examination.