

CHATTANOOGA STATE COMMUNITY COLLEGE
CHATTANOOGA, TENNESSEE
ENGINEERING TECHNOLOGY DIVISION

COURSE SYLLABUS

QA 212 Power Plant Construction & QA/QC

Instructor:
Phone:
E-mail:

Class Hours/Credit Hours: 4
Semester: Fall
Room:

Catalog Course Description

This course will cover the activities related to the construction of power plants, erection of buildings and major equipment pedestals, flashing, transfer of systems from construction to operations, startup testing and ascension testing. It will also address all applicable codes and standards. Body of knowledge topics will include the performance of specific inspections / examination activities for power industry construction inspection in accordance with ANSI N45.2 series of standards. (Class 3 hours, Lab 3 hours)

Prerequisites:

QA 146, QA 147

Corequisites:

None

Entry Level Standards

College Level

Textbook/Materials

Elliott, Chen, Swanekamp, Standard Handbook of Power Plant Engineering, McGraw Hill, 2nd Edition, 1998.

(required)

Ellenberger, Chuse, Carson, Pressure Vessels The ASME Code Simplified, McGraw Hill, 8th Edition, 2004. (optional)

I. Competencies

- C1 Explain power plant systems, terms, and definitions.
- C2 Perform basic power plant engineering design calculations.
- C3 Explain proper design and application of power plant related equipment.
- C4 Explain methods of diagnosing equipment misoperation or misapplication..
- C5 Explain standards utilized in the design and operation of power plant equipment.
- C6 Explain the history of the ASME code.
- C7 Explain how to use reference material for designs, materials, performance requirements, and safety of pressure vessels according to ASME code.
- C8 Explain basic causes of pressure vessel accidents.
- C9 Explain how to make inspections of ASME code vessels.

II. Topics:

Week	Topic
1	Introduction to Power Plant Engineering and Energy Resources for Power Generation.
2	Steam Power Plants: Steam Fundamentals, Basic Power Plant Design, Steam Generators, Boiler Auxiliaries, Cooling Towers, and Water Treatment.
3	Prime Moers: Steam Turbines, Gas Turbines, Hydraulic Turbines, Oil and Gas-Fired Reciprocating Engines.
4	Plant Electrical Systems: AC Generators, Transformers, In-Plant Distribution, AC Motors, Busway and Cable Applications.
5	Instrumentation and Control: Power Plant Instruments, Combustion Control, Turbine and Engine Governors, Key Systems and Components, Human Engineering.
6	Nuclear Plant Systems: Fission Theory, Nuclear Steam Supply Systems, Nuclear Plant Operation, Reactor Safety.
7	Review, Mid-Term Exam.
8	Hydroelectric Power Stations: Features of a Hydro plant, Dams, Spillways, Water Conductors, Powerhouse, Auxiliary Equipment, Hydroelectric Generators, Transformers and Controls.
9	Alternative Energy: Solar, Geothermal, Wind, Wood/Biomass, Waste-Fired, Fuel Cell Plants.
10	Environmental Controls: Environmental Law, Air Emission Controls, Water Emissions, Solid Waste Management, Power Plant Noise.
11	Origin, Development, and Jurisdiction of the ASME Code.
12	Descriptive Guide to the ASME Code Section VIII, Division I Pressure Vessels.
13	Design for Safety, Inspection and Quality Control of ASME Code Vessels.
14	Final Exam

III. Instructional Activities

11. Read chapters as assigned. [C1—C9]
12. Work problems discussed in class covering appropriate sections of the textbook. [C1—C9]
13. Complete tests covering appropriate sections of the textbook. [C1—C9]

IV. Student Outcomes

- SO1 List the energy resources for power generation. [I1—I3]
- SO2 List characteristics of coal, its uses, and transportation systems. [I1—I3]
- SO3 Describe uranium processing methods. [I1—I3]
- SO4 Describe fuel elements. [I1—I3]
- SO5 Describe the process of handling spent fuel. [I1—I3]
- SO6 Define thermodynamic properties. [I1—I3]
- SO7 List steam properties. [I1—I3]
- SO8 Define the first and second laws of thermodynamics. [I1—I3]
- SO9 Describe steam power cycles. [I1—I3]
- SO10 Describe basic power plant design. [I1—I3]
- SO11 Describe different types of steam generators. [I1—I3]
- SO12 Describe the operation of auxiliary boilers. [I1—I3]
- SO13 Describe the operation of cooling towers. [I1—I3]
- SO14 Describe power plant water treatment systems. [I1—I3]

SO15	Describe steam turbine design. [I1—I3]
SO16	Describe hydraulic turbine design. [I1—I3]
SO17	Describe the design and operation of AC Generators and generator protection. [I1—I3]
SO18	Describe the design and operation of transformers and transformer protection. [I1—I3]
SO19	Describe In-Plant Electrical Distribution. [I1—I3]
SO20	Describe the design and operation of AC Motors. [I1—I3]
SO20	List instruments used in power plant operation. [I1—I3]
SO21	Describe instrument operation. [I1—I3]
SO22	Describe the theory of nuclear fission. [I1—I3]
SO23	Explain nuclear supply systems. [I1—I3]
SO24	List Reactor Safety Standards. [I1—I3]
SO25	Explain the general features of a hydroelectric plant. [I1—I3]
SO26	List environmental laws pertaining to air emissions and water emissions. [I1—I3]
SO27	Give the history of the ASME code. [I1—I3]
SO28	List ASME standards for pressure vessels. [I1—I3]
SO29	List causes of vessel failure. [I1—I3]
SO30	List tests used for inspection and quality control of pressure vessels. [I1—I3]

V. Assessment

- A. Tests: A minimum of two tests will be given during the semester. The tests will allow the student to demonstrate their problem solving skills. Each test may consist of multiple choice or discussion type questions along with problems. The tests will generally not be comprehensive, but will cover the material since the previous test. The tests will count for 40%--60% of the overall grade.
- B. Assignments/Quizzes may be made by the instructor. Assignments must be completed in a professional manner and turned in when scheduled. At the discretion of the instructor, late assignments may not be accepted. Quizzes may be given at random times during the semester. The quizzes cannot be made up if class is missed. The quizzes are designed to encourage keeping up with course material, class attendance and participation. The assignments and quizzes will count for 10%--20% of the final grade.
- C. Final Exam: The final exam will be given during the scheduled final exam period. The final exam will be comprehensive. The final exam will count for 20%--40% of the overall grade.
- D. Grade Determination:
- | | |
|---------------------|-----------------|
| Tests | 40%--60% |
| Assignments/Quizzes | 10%--20% |
| Final Exam | <u>20%--40%</u> |
| Total | 100% |

VI. Grading Scale

90—100	A
80—89.9	B
70—79.9	C
65—69.9	D
0—64.9	F

VII. Course Delivery Format

Standard Format

VIII. College Policies

This class is governed by the policies and procedures stated in the current Chattanooga State Student Handbook. Additional or more specific guidelines may apply.

ADA Statement

Students who have educational, psychological, and/or physical disabilities may be eligible for accommodations that provide equal access to educational programs and activities at Chattanooga State. These students should notify the instructor immediately, and should contact Disabilities Support Services within the first two weeks of the semester in order to discuss individual needs. The student must provide documentation of the disability so that reasonable accommodations can be requested in a timely manner. All students are expected to fulfill essential course requirements in order to receive a passing grade in a class, with or without reasonable accommodations.

Disruptive Students

The term "classroom disruption" means – student behavior that a reasonable person would view as substantially or repeatedly interfering with the activities of a class. A student who persists in disrupting a class will be directed by the faculty member to leave the classroom for the remainder of the class period. The student will be told the reason(s) for such action and given an opportunity to discuss the matter with the faculty member as soon as practical. The faculty member will promptly consult with the division dean and the college judicial officer. If a disruption is serious, and other reasonable measures have failed, the class may be adjourned, and the campus police summoned. Unauthorized use of any electronic device constitutes a disturbance. Also, if a student is concerned about the conduct of another student, he or she should please see the teacher, department head, or division dean.

Affirmative Action

Students who feel that he or she has not received equal access to educational programming should contact the college affirmative action officer.

Academic Integrity/Academic Honesty

In their academic activities, students are expected to maintain high standards of honesty and integrity. Academic dishonesty is prohibited. Such conduct includes, but is not limited to, an attempt by one or more students to use unauthorized information in the taking of an exam, to submit as one's own work, themes, reports, drawings, laboratory notes, computer programs, or other products prepared by another person, or to knowingly assist another student in obtaining or using unauthorized materials. Plagiarism, cheating, and other forms of academic dishonesty are prohibited. Students guilty of academic misconduct, either directly or indirectly through participation or assistance, are immediately responsible to the instructor of the class. In addition to other possible disciplinary sanctions, which may be imposed through the regular institutional procedures as a result of academic misconduct, the instructor has the authority to assign an "F" or zero for an activity or to assign an "F" for the course.

Tigermail is the official means of communication for the College.

The instructor reserves the right to modify this syllabus in writing during the course of the semester.

IX. Instructor Policies

TBD