CHATTANOOGA STATE COMMUNITY COLLEGE
CHATTANOOGA, TENNESSEE
ENGINEERING TECHNOLOGY DIVISION

COURSE SYLLABUS

NP 110 Power Plant Components

Instructor:
Phone:
E-mail:

Credit Hours: 4
Semester: Fall 2010
Room:

Catalog Course Description
The purpose of this course is to introduce students to fundamental components and pieces of equipment used throughout nuclear power facilities such as pumps, valves, valve operators, filters, heat exchangers, air compressors, diesel engines, and steam turbines. The course will cover the purpose, design, operation, and maintenance requirements of many of the devices listed in ACAD 90-016. Human error prevention, troubleshooting, and communication skills will be emphasized. (Class 3 hours, Lab 3 hours)

Prerequisites:
None

Corequisites:
NP 101

Entry Level Standards

Textbook/Materials
1. Power Plant Components, 2010 Schoolcraft Publishing (Required).
2. Electrical Generation and Distribution Equipment/Steam Turbines, 2010 Schoolcraft Publishing (Required).
3. Safety, 2010 Schoolcraft Publishing (Required).

Institutional Student Learning Outcomes
ISLO1. Communication
ISLO2. Competence in Specialty Area
ISLO6. Critical Thinking and Analytical skills

Program Student Learning Outcomes
PSLO1. An ability to apply knowledge of mathematics, basic sciences, and technology to solve problems appropriate to the nuclear power engineering technology program. [ISLO6]
PSLO7. An ability to communicate effectively. [ISLO1]
PSLO11.An ability to use the techniques, skills, and modern engineering tools necessary to function as
a nuclear power engineer technician. [ISLO2]

I. Course Student Learning Outcomes

CSLO1 Provide students with the knowledge and skills necessary to operate and monitor components found in nuclear power plants. [PSLO11, PSLO7]

CSLO2 Provide students with knowledge of basic construction of nuclear power plant components. [PSLO1]

CSLO3 Satisfy the requirements for the Nuclear Uniform Curriculum Program Certificate. [PSLO11]

Alignment of Assessments with CSLOs (actual assessments are defined below)		
CSLO1	CSLO2	CSLO3
a) Lab Assignments b) Quizzes c) Section Tests d) Final Exam	a) Lab Assignments b) Quizzes c) Section Tests d) Final Exam	a) Lab Assignments b) Quizzes c) Section Tests d) Final Exam

II. Topics:

Week	Topic
1	**8/30-9/3**-Measurements,Piping Systems Chapters 1,2 PPC
2	**9/6-9/10**-Fluid Mechanics, Piping Accessories Chapters 3,4 PPC
3	**9/13-9/17**-Valves Chapters 5-7 PPC
4	**9/20-9/24**-Valve Operators Chapters 8-10 PPC
5	**9/27-10/1**-Final Control, Pumps Chapters 11-13 PPC
6	**10/4-10/8**-Pumps, Lubrication Principles Chapters 14-16 PPC
7	**10/11-10/15**-Lubrication Principles, Strainers, Filters, and Traps, Pneumatic Principles Chapters 17-20 PPC
8	**10/20-10/22**-Air Compressors, Refrigeration and Air-Conditioning Basics Chapters 21-23 PPC
9	**10/25-10/29**-Refrigeration and Air Conditioning Chapters 24-27 PPC
10	**11/1-11/5**-Basic Electricity, Diesel Generators Chapters 1,2 ES
11	**11/8-11/12**-Steam Turbines Chapters 3-4 ES
12	**11/15-11/19**-Steam Turbines Chapters 5-6 ES
13	**11/22-11/26**-Safety Chapters 1-3 Safety
14	**11/29-12/3**-Safety Chapters 4-7 Safety
15	**12/6-12/10**-Safety Chapters 8-10 Safety
16	**12/13-12/17**-Final Exam Week

Important Dates

9/6- Labor Day Holiday-No Class
9/15- Activity Period at 10:00-Student Chapter of the American Nuclear Society Meeting.
9/30- Test 1 Chapters 1-10
10/8 -Activity Period at 11:00-Student Chapter of the American Nuclear Society Meeting
10/18- Fall Break-No class
10/28- Test 2 Chapters 11-22
11/25-Thanksgiving Holiday-No class
11/26-No Class
12/9-Test 3 Chapters 23-27 PPC, Chapters 1-6 ES, Diesel Generators, Safety.
12/10-Last Day of Class
12/15-Final Exam

III. Course Objectives

O1 Identify types of manual valves and state their use. [CSLO 1,2,3} 2.1.3
O2 Identify the major components of a basic gate valve. [CSLO 1,2,3] 2.1.3
O3 State the correct operation of valves. [CSLO 1,2,3] 2.1.3
O4 Describe position indication. [CSLO 1,2,3] 2.1.3
O5 Identify types of valve operators. [CSLO 1,2,3] 2.1.4
O6 Describe the principles of operation for motor-operated valves, air-operated valves, and hydraulic-operated valves. [CSLO 1,2,3] 2.1.4
O7 Describe failure mechanisms and symptoms.[CSLO 1,2,3] 2.1.4
O8 Describe manual operation. [CSLO 1,2,3] 2.1.4
O9 Describe the impact of environmental conditions. [CSLO 1,2,3] 2.1.4
O10 Describe series and parallel pump operation. [CSLO 1,2,3] 2.1.2
O11 Describe pump components. [CSLO 1,2,3] 2.1.2
O12 Describe failure mechanisms and symptoms (such as excessive vibration, seizure, bad bearings). [CSLO 1,2,3] 2.1.2
O13 Describe the impact of environmental conditions such as dust and/or moisture. [CSLO 1,2,3] 2.1.2
O14 List pumps operating characteristics. [CSLO 1,2,3] 2.1.2
O15 Describe types of pumps. [CSLO 1,2,3] 2.1.2
O16 Determine oil levels on plant equipment. [CSLO 1,2,3] 2.1.1
O17 List factors that affect lubrication. [CSLO 1,2,3] 2.1.1
O18 Describe friction and wear. [CSLO 1,2,3] 2.1.1
O19 List different types of lubricants and give the characteristics. [CSLO 1,2,3] 2.1.1
O20 Describe the purpose and necessity of lubrication. [CSLO 1,2,3] 2.1.1
O21 Describe the symptoms and problems associated with improper lubrication. [I1—I3] 2.1.1
O22 Describe safety hazards. [CSLO 1,2,3] 2.1.1
O23 State the purpose of strainers and filters. [CSLO 1,2,3] 2.1.5

O24 List types of strainers and filters, and describe the principles of operation. [CSLO 1,2,3] 2.1.5
O25 State the purpose of the steam traps. [CSLO 1,2,3] 2.1.6
O26 List types of steam traps, and describe the principles of operation. [CSLO 1,2,3] 2.1.6
O27 Describe the main components of steam turbines. [CSLO 1,2,3] 2.1.7
O28 Classify steam turbines according to steam flow. [CSLO 1,2,3] 2.1.7
O29 Describe the principles of operations of steam turbines. [CSLO 1,2,3] 2.1.7
O30 Describe support systems such as electro hydraulic controls, condensers, moisture separator reheaters, and preheaters. [CSLO 1,2,3] 2.1.7
O31 Describe failure mechanisms and symptoms. [CSLO 1,2,3] 2.1.7
O32 Describe the purpose of heat exchangers. [CSLO 1,2,3] 2.1.8
O33 Describe different types of heat exchangers. CSLO 1,2,3] 2.1.8
O34 Classify heat exchangers by flow. [CSLO 1,2,3] 2.1.8
O35 Classify heat exchangers by heat transfer process. [CSLO 1,2,3] 2.1.8
O36 List the major components of heat exchangers. [CSLO 1,2,3] 2.1.8
O37 Describe the principles of operation of heat exchangers. [CSLO 1,2,3] 2.1.8
O38 Describe failure mechanisms and symptoms of heat exchangers. [CSLO 1,2,3] 2.1.8
O39 Describe types of air compressors. [CSLO 1,2,3] 2.1.9
O40 List air compressor components. [CSLO 1,2,3] 2.1.9
O41 Describe the principles of operation of air compressors. [CSLO 1,2,3] 2.1.9
O42 Describe failure mechanisms and symptoms of air compressors. [CSLO 1,2,3] 2.1.9
O43 Describe the principles of operation of diesel engines. [CSLO 1,2,3] 2.1.10
O44 Describe the main structural components of diesel generators. [CSLO 1,2,3] 2.1.10
O45 Describe the main moving components of diesel generators. [CSLO 1,2,3] 2.1.10
O46 Describe diesel generator support systems. [CSLO 1,2,3] 2.1.10
O47 Describe failure mechanisms and symptoms of diesel generators. [CSLO 1,2,3] 2.1.10
O48 Describe electrical generators. [CSLO 1,2,3] 2.1.10
O49 Describe the principles associated with switchgear, load centers and motor control centers. [CSLO 1,2,3] 2.1.11
O50 Describe switchyard equipment. [CSLO 1,2,3] 2.1.11
O51 Describe transformers. [CSLO 1,2,3] 2.1.11
O52 Describe motors and control circuits associated with electrical distribution equipment. [CSLO 1,2,3] 2.1.11
O53 Explain the impact of environmental conditions on electrical equipment. [CSLO 1,2,3] 2.1.11
O54 Describe the purpose of refrigeration equipment. [CSLO 1,2,3] 2.1.13
O55 Describe basic equipment such as chiller units, heating units, fans, blowers, filters, ductwork, blowout ducts. [CSLO 1,2,3] 2.1.13
O56 Describe principles of operation of refrigeration equipment. [CSLO 1,2,3] 2.1.13
O57 Describe major structural components of refrigeration equipment. [CSLO

1,2,3] 2.1.13

O58 Describe failure mechanisms and symptoms of refrigeration equipment. [CSLO 1,2,3] 2.1.13

O59 Describe hazards associated with operating power plant equipment. [CSLO 1,2,3] 2.1.13

O60 Explain the safe operation of power plant equipment. [CSLO 1,2,3] 2.1

O61 Explain principles of fluid flow, including the following: [CSLO 1, 2,3] 1.1.5.4

- Effects of throttling on flow and pressure
- Filling and venting-understanding the concept of high point vents relating to air binding and water hammer
- Fluid properties and mechanics, including laminar and turbulent flow
- Flow within a closed system, to include water hammer, heating, draining, filling and venting, and the effects of throttling
- Pump theory, including cavitation
- Water hammer types and mechanisms

IV. Assessment

Grades will be determined in the following manner:

		Assessment Method
A1. Tests	=50%	Test
A2. Assignments/Quizzes	=10%	Test/Performance
A3. Lab	=20%	Performance
A4. Final Exam	=20%	Test
	100%	

A1. Tests: A minimum of three [3] tests and a final exam will be given. Each test and final exam 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 final exam may or may not be comprehensive at the discretion of the instructor. The tests and final exam will count 70% of the overall grade. [CSLO1,2,3]

A2. 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 are designed to encourage keeping up with course material, class attendance, and participation. The assignments and quizzes will count for 10% of the overall grade. [CSLO 1,2,3]

A3. Lab: Lab expectations will include lab attendance, activities, and reports. All students will submit a lab report following the lab studies. The lab report must contain the following: Lab Title, lab purpose, lab procedure, data collected during the lab study, analysis of the data (calculations, graphs, and percent error, and conclusion). Students will be graded on writing skills, adherence to safety, procedure compliance, and oral communication skills with others. Lab will count

20% of the final grade. Lab will count 20% of the final grade. [CSLO 1,2,3]

A4. 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% of the overall grade. [CSLO 1,2,3]

Certification: Students will be required to make a minimum of an 80 to obtain the Nuclear Uniform Curriculum Program Certification of Completion.

V. Grading Scale

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

VI. Course Delivery Format

Standard Format – This format is the traditional format and may use an on-line format **(eLearn)** to provide access to "static" materials which include the syllabus, course material, contact information, and presentations. Faculty must make available, when requested, a copy of the syllabus and any other instructor provided course materials, including instructor contact information. Faculty may require on-line activities and assignments to include on-line tests and submission of all written and on-line communications. The extent of on-line activities/assignments may vary by course but will be specified on the syllabus.

VII. 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.

SMOKING/TOBACCO USE
Chattanooga State Technical Community College recognizes the increasing weight of scientific evidence that smoking is harmful not only to the “active” smoker but also to the “passive” smoker who is exposed to others’ smoke. Smoking is defined as the lighting or carrying of a lighted cigarette, cigar, pipe, or similar device.

Smoking is prohibited in all college buildings, owned or leased. Additionally, smoking will not be allowed in any college owned vehicles. All building entrances are posted as non-smoking areas. Signs stating “No Smoking within 50 ft of Entrance” are posted at all entrances. Signs are posted al all exits stating “Smoking Prohibited within 50 ft of Building.

The use of mouth tobacco (to include dipping, chewing, etc.) is prohibited in all Chattanooga State buildings, facilities, and vehicles.

The policy applies to all campuses and to the entire college community, including employees, students, and visitors. It is the responsibility of all faculty, staff, and students to adhere to, enforce, and inform visitors of the College's smoking policy. If a student continues to disregard the posting, he/she will be reported to the Dean of Student Affairs. If an employee continues to disregard the posting, he/she will be reported to their respective Vice-President

DESIGNATED SMOKING AREAS
The College has designated "Smoking" areas on campuses and at the sites. These areas can be located on the campus map.

CAMPUS AWARENESS PLAN
The policy shall be published in the College catalog, student handbook, and the policies and procedures manual. Periodic notices shall be placed in other college publications.

Flyers will be posted on all bulletin board and e-mail notices will be sent each semester, which will inform college visitors as well as students, staff, and faculty of the College's position on this issue.

Children
It is Tennessee Board of Regents policy that children are not permitted in the classrooms or laboratories. If you have children who must stay home for some reason, you must make other arrangements for their care than bringing them with you to class.

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. Since this is a new course, the weekly topics calendar may be changed.

VIII. Instructor Policies

Cell Phones
Activation of these devices represents a distraction and their use during lectures and labs (including instant messaging, games, and etc.) will be considered extremely disruptive to the learning environment. Please turn off (or set to vibrate) all such devices before entering the classroom. Please excuse yourself from the room if an emergency requires you to make or receive a phone call during class. If your cell phone goes off during a testing period, five points will be deducted from your test

Use of Computers/Printers
The use of a computer is mandatory for all students. Students will have access to the computers in C24, C33, C54, C84, & C87. These computers are connected to

the ET server and can be used to access Microsoft Office and other software. There may be times when one of the computer rooms will not be available; these times will be posted with as much advance notice as possible. **It is the student's responsibility to see that his or her username and password are working properly and that his or her password is protected.** It is also the student's responsibility to back-up needed files. The school will not be responsible for any computer files that get "lost" or damaged.
Back-up documentation for this class (such as the class syllabus, handouts, description of class assignments, etc.) will be available to the students through eLearn. Printers are to only be used by Engineering Technology students for assignments related to engineering and engineering technology classes or labs. Paper availability may be subject to print management activities and will be requested through assigned faculty. Please help conserve paper.

Classrooms & Labs
Food and drinks are prohibited in all Engineering Technology classrooms, with the exception of water in a closed container. All food and drinks are prohibited in labs located in the Branch Center for Technology. Any form of tobacco products are also prohibited in accordance with College and TBR policy.

To Log-in C24, C33, C54, C84 & C87: Username: ET_last name first initial middle initial *(no spaces)*
Password: student
Domain (log-in): CSTCC

Note: Be sure to change your password after your initial log-in.