

EN 320

3rd Class Power Engineering Part A-2

4 Credits

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EN 320 Version: 5



3rd Class Power Engineering Part A-2

Calendar Description

This course follows the SOPEEC syllabus and curriculum. This course begins with instruction in the legislation & codes for Power Engineers; code calculations – ASME Section I; fuels, combustion, flue gas analysis; piping design, connections, support; steam traps, water hammer, insulation; valves & actuators; electrical theory & DC machines; AC theory & machines; AC systems, switchgear, safety; electrical calculations; control loops & strategies; instrument & control devices; distributed & logic control; safety management programs; and fire protection systems.

Rationale

This is a required course for the Heavy Oil Power Engineering program.

This course is regulated by ABSA (Alberta Boiler Safety Association) which governs any pressure vessel including Boilers. In order to obtain a 3rd Class Certificate you must pass the ABSA 3A2 exam by more than 65%. This exam consists of 150 questions which the student must complete in 3.5 hrs. This course is designed to ensure the student has the knowledge and skills to pass the exam.

Prerequisites

EN 110, EN 114, EN 210, and EN 214

Co-Requisites

None

Course Learning Outcomes

Upon successful completion of this course, students will be able to

1. explain the purpose of, general content of, and interaction with the legislation and codes that pertain to the design and operation of boilers and related equipment.
2. calculate the design thickness and pressure of boiler tubes, drums, and piping, and calculate the capacities of pressure relief valves.

3. explain the properties and combustion of common fuels and the analysis of combustion flue gas.
4. discuss the codes, designs, specifications and connections for ferrous, non-ferrous and non-metallic piping and explain expansion and support devices common to piping systems.
5. explain the designs and operation of steam trap systems, the causes and prevention of water hammer, and the designs and applications of pipe insulation.
6. describe the designs, configurations and operation of the common valve designs that are used in power and process piping.
7. explain basic concepts in the production of electricity and the design, characteristics and operation of DC generators and motors.
8. explain the formation and characteristics of AC power, and describe the design, construction and operating principles of AC generators, motors and transformers.
9. identify the components of typical AC systems and switchgear and discuss safety around electrical systems and equipment.
10. define terms and perform simple calculations involving DC and AC power circuits.
11. explain the operation and components of pneumatic, electronic and digital control loops, and discuss control modes and strategies.
12. explain the operating principles of various instrument devices that are used to measure and control process conditions.
13. explain the general purpose, design, components and operation of distributed and programmable logic control systems.
14. discuss typical legislation and programs that manage safety in the industrial workplace.
15. discuss the classes and extinguishing media of fires, and explain systems that are used to detect and extinguish industrial fires.

Resource Materials

Required Text(s):

The student is expected to purchase a copy of the following textbooks in printed or electronic format.

PanGlobal Third Class Part A2 Textbook, Version 2.5, or latest printing.

2018 ASME Academic Extract Boiler and Pressure Vessel Code (Vol 1), PanGlobal Textbooks.

2018 ASME Academic Extract Boiler and Pressure Vessel Code (Vol 2), PanGlobal Textbooks.

(All of these available in college bookstore or from publisher.)

Reference Text(s):

The following resources are available through purchase or may be borrowed from the college library. The student may use these for supplementary instructional material, but they are not required to complete the course.

Lister, E. C., & Golding, M. R. *Electric Circuits and Machines* (2nd Canadian ed.). McGraw-Hill Ryerson Ltd., 1996 or later.

PanGlobal Third Class Part A2 Workbook, Version 2.0, or latest printing.

Conduct of Course

The course is normally delivered face to face. Because of COVID-19 restrictions we may need to deliver part or all of this course through our D2L online platform. Students complete online quizzes for each chapter and hand in written assignments. Each section has a unit test which is announced in class. There is a Midterm Exam and/or Unit Tests which contain multiple choice and written questions. There is one Final Exam made up of 150 multiple choice exams similar to an ABSA exam.

Plagiarism and cheating are serious offences and may be punished by failure on exam, paper or project, failure in course, and / or expulsion from the course.

Consider your classmates and do not be disruptive to their learning. The use of cell phones is not permitted in the classroom. If you are expecting an important phone call, please leave it on vibrate, and leave the classroom to answer it. The use of electronic devices is permitted for course work only. (e.g. notebook computers).

Evaluation Procedures

The marking scheme for this course will be:

Quizzes (D2L)	15%
Participation	5%
Assignments	5%
Unit Tests	40%
Final	35%

The contents and dates of these assessments are detailed in the course syllabus.

Marks are deducted for late assignments and quizzes. A grade of zero is assigned to missed tests and exams.

A minimum grade of 65% is required to pass this course.

A score of at least 50% is required on the final exam to pass this course.

Grade Equivalents and Course Pass Requirements

A minimum grade of C+ (65%) is required to pass this course.

Letter	F	C+	B-	B	B+	A-	A	A+
Percent Range	0-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

65% is the overall required course mark to pass this course and a minimum of 50% on the final exam.

Attendance

There is a minimum attendance requirement for this course. Please refer to the Energy Department Student Handbook.

Course Units/Topics

1. Legislation and Codes for Power Engineers
2. Code Calculations - ASME Section I
3. Fuels, Combustion, Flue Gas Analysis
4. Piping Design, Connections, Supports
5. Steam Traps, Water Hammer, Insulation
6. Valves & Actuators
7. Electrical Theory and DC Machines
8. AC Theory & Machines
9. AC Systems, Switchgear, Safety
10. Electrical Calculations
11. Control Loops & Strategies
12. Instrument & Control Devices
13. Distributed & Logic Control
14. Safety Management Systems
15. Fire Protection Systems



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