EN 420

3rd Class Power Engineering Part B-2

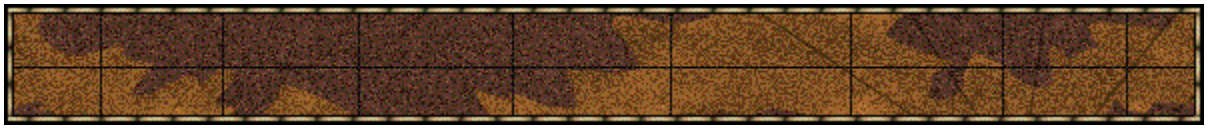
4 Credits

Instructor: Simon Stilgoe; Russ Webb; Daniel Jantzen; Reg Lee
780 871 5497; 780 871 5484; 780 871 5486; 780 871 5481
Original Developer: Normand Arseneault
Current Developer: Normand Arseneault
Reviewer: Robert Collins
Created: 26/03/2012
Revised: 16/11/2020
Approval: 07/12/2020

The Implementation Date for this Outline is 01/01/2021

Copyright©LAKELAND COLLEGE. Email: admissions@lakelandcollege.ca
2602 - 59 Avenue, Lloydminster, Alberta, Canada T9V 3N7. Ph: 780 871 5700
5707 College Drive, Vermilion, Alberta, Canada T9X 1K5. Ph: 780 853 8400
Toll-free in Canada: 1 800 661 6490

EN 420 Version: 6



3rd Class Power Engineering Part B-2

Calendar Description

This course follows the SOPEEC syllabus and curriculum. The course is a study of the following: Design and Operation of Steam Turbines and Condensers; Design and Operation of Industrial Gas Turbines; Design and Operation of Internal Combustion Engines; Cogeneration; Design and Operation of Air Compressors; Refrigerants and Refrigeration; Heat Exchangers; Fired Process Heaters; Industrial Waste Water Treatment; Industrial Maintenance and Administration.

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 3B2 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. describe designs, operating principles and major components of steam turbines.
2. describe auxiliary support and control systems for steam turbines and explain start-up and shut-down procedures.
3. explain typical designs, components and operating principles of steam turbine condensers.

4. explain common designs, major components, operating principles, and arrangements for industrial gas turbines.
5. describe the support auxiliaries for a gas turbine and explain common operational, control and maintenance procedures.
6. explain the operating principles, designs, support systems, and operation of industrial internal combustion engines (ICE).
7. explain cogeneration and describe common configurations, components and applications.
8. explain the classification, designs, and operating principles of industrial air and gas compressors.
9. explain the controls and system auxiliaries for a typical instrument air system and explain startup procedures for air compressors.
10. explain the classification and properties of refrigerants and describe the operating principles and components of compression and absorption systems.
11. explain control and safety devices on a compression refrigeration system and explain procedures and equipment to control oil, non-condensables, moisture, refrigerant, and brine.
12. describe the design, operation, and applications of various types of industrial heat exchangers.
13. describe the design, components, operation, and applications of direct-fired and indirect-fired natural draft process heaters.
14. explain the purpose, designs, processes and control of industrial wastewater treatment.
15. explain typical components of maintenance and administration programs for utilities and process facilities.

Resource Materials

***Required Text(s)*:**

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

Third Class Power Engineering Part B2 Textbook, version 2.5, or latest printing. PanGlobal Publications. Available from publisher or in college bookstore.

Extract of CSA Standards, Sections B51-09, B52-05, B52S1-09. PanGlobal Publications. Available from publisher or in college bookstore.

***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.

Third Class Power Engineering Part B2 Workbook, Version 2.0. PanGlobal Publications.

Available from publisher or in college bookstore.

Conduct of Course

The course is normally delivered face to face, but 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. There is a Midterm Exam and/or Unit Tests which contain multiple choice and written questions. An open-book Review Test is administered before the Final Exam. 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

Quizzes	15%
Participation	5%
Assignments	5%
Unit Tests	40%
Review Test	5%
Final	30%
Total	100%

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.

Materials allowed for tests and exams are as per ABSA examination standards.

An overall grade of 65%, and a minimum of 50% on the final, are required 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

Attendance

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

Course Units/Topics

Chapter 1 – Steam Turbine Principles & Design

Chapter 2 – Steam Turbine Auxiliaries & Operation

Chapter 3 – Turbine Condenser Systems

Chapter 4 – Gas Turbine Principles & Design

Chapter 5 – Gas Turbine Auxiliaries & Operation

Chapter 6 – Internal Combustion Engines

Chapter 7 – Cogeneration Systems & Operation

Chapter 8 – Compressor Theory & Designs

Chapter 9 – Compressor Auxiliaries & Operation

Chapter 10 – Refrigeration Principles & Systems

Chapter 11 – Refrigeration Auxiliaries & Operation

Chapter 12 – Heat Exchangers & Cooling Towers

Chapter 13 – Fired Heaters

Chapter 14 – Wastewater Treatment

Chapter 15 – Plant Maintenance & Administration

Copyright©LAKELAND COLLEGE.
2602 - 59 Avenue, Lloydminster, Alberta, Canada T9V 3N7. Ph: 780 871 5700
5707 College Drive, Vermilion, Alberta, Canada T9X 1K5. Ph: 780 853 8400
Toll-free in Canada: 1 800 661 6490 E-mail: admissions@lakelandcollege.ca