# EN 454

# Fuels & Combustion

## 2 Credits

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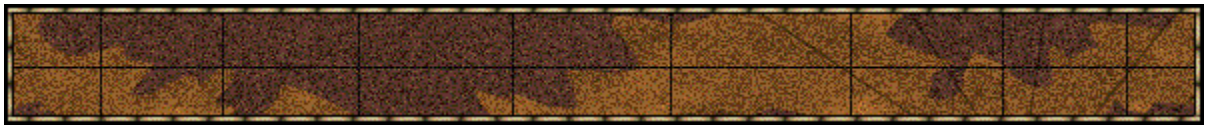
# EN 454 Version: 2



# Fuels & Combustion

## Calendar Description

This course is a study of combustion chemistry, fuels analysis and handling, furnace and firing equipment and draft systems. Combustion control systems, flue-gas analysis, and safety are also studied.

## Rationale

This course has been developed to fill the gap of Second Class Power Engineers created by the retiring generation of power engineers.

Industry has shifted their focus from employing the lower levels of certification of power engineers to the higher levels of certification.

Upon successful completion of this program the student is eligible for a 9 month reduction in qualifying time experience granted by ABSA.

The six parts of the program are divided into 15 courses where the student has the option of registering for individual courses, Part A, Part B, or both Part A and Part B.

## Prerequisites

EN 310, EN 320, EN 410, EN 420, or Third Class Power Engineer's Certificate of Competency.

## Co-Requisites

None

## Course Learning Outcomes

Upon successful completion of this course, the student will be able to

1. describe steam generator furnace designs including cyclone furnaces and divided furnaces. Explain the purpose and placement of furnace arches.
2. explain the purpose and design of separately fired superheat and reheat furnaces.
3. explain the purpose, types, characteristics, and placement of refractory in a furnace.

4. describe the principle, design and application of oil, gas, and coal burners.
5. describe the principle, design, and application of pulverizers.
6. describe the principle, design, and application of ash and slag disposal systems.
7. explain the significance, monitoring, and control of ash fusion temperature.
8. describe the designs and applications of forced and induced draft fans.
9. explain the methods which control furnace draft.
10. describe, using a sketch, the combustion control arrangements in a steam generator.
11. explain series, parallel, and series/parallel combustion control.
12. explain turbine-following, boiler following, and integrated combustion control systems.
13. describe the operation of purge, fan failure, and flame failure interlock systems.
14. describe the operation of flame detectors.
15. describe, using a sketch, a typical programming sequence for a packaged boiler control system.
16. describe the typical limiting devices and alarms for a packaged boiler combustion system.

## Resource Materials

***Required Text***:

Power Engineering Second Class (2015) B-2 Combustion and Plant Systems (2nd ed.).

Calgary, AB: PanGlobal Training Systems Ltd.

NOTE:

Additional resource material is provided or accessed through D2L

## Conduct of Course

This course follows the syllabus as set out by the Standardization of Power Engineer's Examination Committee (SOPEEC) and the curriculum recommended by the Interprovincial Power Engineer Curriculum Committee (IPECC).

This course builds on the student knowledge gained through the Fourth Class and Third Class courses.

This course is delivered face to face and includes class lectures, group discussions, demonstrations, assignments and projects.

Cutaway models and actual equipment may be used to support instruction and demonstrations.

Where applicable video clips may be used to support instruction and demonstrations.

D2L is used as a support educational resource.

This course consists of two chapters. There is an exam at the end of each chapter as well as a midterm and final exam.

The exams consist of seven written questions of which the student chooses five questions to answer.

## Evaluation Procedures

Lakeland College is committed to the highest academic standards. Students are expected to be familiar with Lakeland College policies related to academic conduct and academic honesty and to abide by these policies.

The marking scheme for this course is:

| | |
|---|---|
| Assignments and Projects | 20% |
| Chapter Exams | 20% |
| Midterm Exam | 30% |
| Final Exam | 30% |

The contents and dates of the chapter exams are determined in class.

All questions are long answer written types of questions.

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

A GRADE OF AT LEAST 60% IS REQUIRED ON THE FINAL EXAM TO PASS THIS COURSE.

Those students seeking a qualifying time reduction must achieve a grade of 65% for sections A-1, A-2. A-3. B-1, B-2, B-3and maintain at least 80% attendance in the program. .

Students receive a certificate from Lakeland College indicating successful completion of the program.

NOTE:

This program consists of six components; each component corresponds to one examination paper of the Alberta Boilers Association (ABSA) examination process.

The requirements for a second class power engineer consist of six ABSA examinations and 30 months of qualifying industry experience, with the exception of a 9 month credit for completion of all courses in the program.

## 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

For those students seeking the (9) month experience qualifying time reduction granted by ABSA, a minimum attendance of 80% in all courses is required, refer to the Student Handbook. If the experience credit is not desired, there is no mandatory attendance requirement.

## Course Units/Topics

Firing and Draft Equipment

(Explain the design, components, and auxiliary equipment of steam generator furnaces)

Combustion Control and Safeguards

(Explain combustion control methods and safeguard controls)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