



## Course Outline

### 4th Class Power Engineering Online 2019-2020

#### **PELM 4200 Plant Services**

*4 credits*

Topics include elements of basic concepts in electro-technology, energy plant instrumentation and controls, fundamental industrial communication skills, introduction to boiler designs, and elements of boiler systems as identified in the Alberta Boilers Safety Association Reference Syllabus for 4th Class Part A Power Engineering.

**Recommended Prerequisites:** It is strongly recommended that students have Math 20/23 or Math 20 Applied, Physics 20 or Science 20 and English 20 (Grade 11).

#### **Instructors**

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**Contact Information**

Keyano College Power Engineering Department  
780-791-4955  
Power.engineering@keyano.ca

**Tutoring Hours**

Tuesday & Thursday 6:30on – 9:30pm at Keyano College Bob Lamb Building Room 150. Please contact the Power Engineering office at 780-791-4955 for an appointment.

**Required Resources:** (Available at Keyano College Bookstore)

Power Engineering Fourth Class (Textbook), Part A PanGlobal, Edition 3.0, ISBN 978-1-77251-071-3

Academic Supplement, PanGlobal, Edition 2.0, ISBN 978-1-77251-073-7

2018 ASME Boiler & Pressure Vessel Code Volume 1, Academic Abstract 2018 Edition, ISBN 978-1-77251-108-6

**Recommended Resources:**

Power Engineering Fourth Class (Workbook), Part A PanGlobal, Edition 3.0, ISBN 978-1-77251-075-1

## Course Outcomes

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

- Describe basic electricity and electromagnetism, and apply concepts to calculations using voltage, current, resistance, and power.
- Discuss metering devices, motors, generators, and transformers, and understand electrical distribution circuits.
- Describe energy plant controls and instrumentation, as well as process measurement and types of control systems commonly used in plants.
- Illustrate methods of plant communications, energy plant sketching, and plant diagrams, and understand the importance of these with regard to safe plant operation.
- Describe common types of boilers found in power and heating applications, including their construction and ancillary equipment.
- Describe the elements, and importance, of various boiler systems including fuels and combustion, draft, feedwater, blowdown, and sootblowing.

## Evaluation

Students will be graded using percentage scales.

Category	Weight
Section "S" Test	10%
Section "S" Test	10%
"E" Exams	70%

Moodle Chapter & Unit Quizzes	10%
Total Grade	100%

*The minimum standard for passing the overall course is a grade of 65%.*

### Performance Requirements

The Power Engineering online program provides access to a comprehensive computer question bank designed to highlight subjects in the Alberta Boiler’s Branch syllabi. Assessments are generated and marked by the Computer and Power Engineering Instructors. The online program is supplemented by tutorial assistance offered by qualified instructors during posted hours.

### Behaviours of a Successful Student



**SKILL Centre Information:**

The SKILL Centre is a learning space in the Clearwater Campus where students can gather to share ideas, collaborate on projects and get new perspectives on learning from tutorial staff. A student conference room is available for students to “reserve” for student group purposes. The SKILL Centre is for support and reinforcement of course concepts. Hours of operation are Monday – Friday 8:30am - 4:30pm. Additional evening and weekend tutorial hours will be posted in the Skill Centre or please contact [skill@keyano.ca](mailto:skill@keyano.ca) to confirm tutoring availability.

**Keyano College Student Rights and Code of Conduct:**

It is the student’s responsibility to familiarize themselves with the Student Rights and Responsibility Policy found in the Keyano College Credit Calendar 2019-2020, pages 40-43. The information contained in this policy should guide the student’s conduct while attending Keyano College.

**Teaching & Learning Methodologies**

This course is delivered by online testing through iLearn/Moodle; <http://ilearn.keyano.ca>

- iLearn/Moodle will be used for ongoing assessment purposes. Please be patient and forward questions/concerns regarding the test bank to the Power Engineering Department.
- All quizzes and exams on iLearn will open in a SECURE window. Any attempts to breach security measures (i.e. copy, print, screen capture, right clicking, navigation away from quiz/exam window, etc.) will automatically eject you out of the quiz. Occurrences of this nature will be documented and kept on student record, be considered academic misconduct and just cause for disqualification of course completion.

**Student Academic Support Services**

It is the College’s goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on a disability, please let your instructor know immediately so options can be discussed. You are also welcome to contact Student Academic Support Services to establish reasonable accommodations. Please call 780-791-8934 or drop in at CC167.

It is your responsibility to contact the Office of the Registrar to **update your contact information** and complete forms related to changes of registration.

Keyano College

**Office of the Registrar**

8115 Franklin Avenue

Fort McMurray, AB

T9H 2H7

Tel: (780) 791-4801

Fax: (780) 791-4952

Keyano College Main Switchboard Toll Free: 1-800-251-1408

Email: [registrar@keyano.ca](mailto:registrar@keyano.ca) [www.keyano.ca](http://www.keyano.ca)

Please be advised, the Office of the Registrar will only use Keyano student email to communicate with students. Check your student email regularly for important information.

## Learning Outcomes

1. Apply the concepts of basic electricity while performing simple calculations using voltage, current, resistance, and power.
2. Describe the basic principles of magnetism.
3. Describe the design and application of electrical metering devices.
4. Describe the operating principles of the various types of AC and DC motors and generators.
5. Describe the operating principles of electrical transformers.
6. Describe an electrical distribution system.
7. Describe the overall purpose and function of plant instrumentation systems.
8. Describe the construction and operation of common devices used to measure pressure, level, flow, temperature, humidity, and composition.
9. Describe the basic types and functions of transmitters, recorders, controllers, and control actuators.
10. Describe the operation of programming controls for boilers, including applicable testing and maintenance procedures.
11. Describe the design and operation of electronic control systems.
12. Describe the design and operation of electrical control systems.
13. Make basic engineering sketches of plant equipment.

14. Identify common types of diagrams used in plants.
15. Describe the types and proper usage of plant communication systems.
16. Describe the historical development of boilers, boiler design, components, and configuration.
17. Describe the design, components, and characteristics of firetube boilers.
18. Describe the design, components, and characteristics of watertube boilers.
19. Explain the general design and application of electric boilers.
20. Describe the special design considerations of boilers used in heating plants.
21. Differentiate between ASME Section I and ASME Section IV boilers.
22. Discuss the basic theory of combustion and the equipment used to provide proper combustion conditions within a boiler.
23. Describe common fuel systems found in boiler systems.
24. Describe basic concepts and equipment used to supply combustion air to boiler furnaces.
25. Describe Feedwater systems used with boilers.
26. Describe the equipment, operation, and purpose of boiler blowoff and blowdown systems.
27. Describe the importance of fireside cleanliness, and the equipment and methods to maintain fireside cleanliness.