



## Course Outline

### 3rd Class Power Engineering Online 2019-2020

#### **PELM 3300 Steam Generation**

Topics covered are boilers, boiler control systems, heating and air conditioning, feedwater treatment, pumps, and welding as identified in the Alberta Boilers Safety Association Reference Syllabus for the first paper of 3<sup>rd</sup> Class Part B 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 780791-4955 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 Power Engineering Fourth Class(Textbook), Preparatory Topics for Power Engineers, PanGlobal, ISBN 978-1-77251-074-4 Academic Supplement, PanGlobal, Edition 2.0, ISBN 978-1-77251-073-7 2018 ASME Boiler & Pressure Vessel Code Volume 2, Academic Extract, 2018 Edition, ISBN 978-1-77251109-3

## Course Outcomes

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

- Discuss the designs & fabrication of many types of boilers including the high pressure fittings attached.
- Describe boiler heat transfer components and the variety of burner designs & supply systems.
- Explain boiler draft equipment including, air flow/fuel flow/multielement combustion controls and boiler operation, maintenance, testing, start-up & shut-down procedures.
- Evaluate boiler water treatment before and after boiler feedwater enters boilers.
- Analyze the designs of pumps including pump operation characteristics, pump calculations and operations
- Discuss welding processes, shielded metal arc welding, submerged arc welding, gas tungsten arc welding, gas metal arc welding, weld

inspections, welding procedures, performance qualifications pressure vessels designs, operations and code requirements.

## 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. Describe common designs, configurations and circulation patterns for modern bent-tube watertube boilers and steam generators and explain how boilers are rated.

2. Describe the designs, components, firing methods, and operating considerations for some special boilers used in industry.
3. Explain Code requirements, in general terms, and describe construction and assembly methods for the major components of a large boiler.
4. Explain the purpose, location, design and operating conditions for the major heat transfer components of a large watertube boiler or steam generator.
5. Describe the design and operation of common external and internal fittings attached to the pressure side of a high-pressure boiler.
6. Describe the typical components of fuel supply systems and describe common burner/furnace designs for gas, oil, and coal-fired boilers.
7. Explain boiler draft systems and fans and describe the equipment used to remove ash from flue gas
8. Explain the components and operation of automatic control systems for boiler water level, combustion, steam temperature, and start-up.
9. Describe common procedures in the operation and maintenance of high pressure boilers.
  
10. Define properties of saturated and superheated steam and, using information from the steam tables, calculate the heat required to produce steam at various conditions; determine the evaporation in steam boilers.
11. Explain the purpose, principles, equipment, and monitoring of boiler water pretreatment processes.
12. Describe the designs, principles, components and operating procedures for common industrial pumps.
13. Explain proper priming and start-up procedures and considerations for pumps.
14. Explain the processes and applications of different welding techniques and describe the testing of welds and procedures.
15. Explain pressure vessel design, stresses, and operating considerations.