



## Course Outline

Power Engineering: On-Line

Fourth Class

### **PELM 4300 Steam Generation**

*4 credits*

Topics include lubrication and bearings, pumps and compressor types and operation, boiler safety devices, boiler plant operation and management, energy plant maintenance, and in-plant water treatment as identified in the Alberta Boilers Safety Association Reference Syllabus for 4th 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](mailto: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 B PanGlobal, Edition 3.0, ISBN 978-1-77251-072-0

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 978-177251108-6 Recommended Resources:

Power Engineering Fourth Class (Workbook), Part B PanGlobal, Edition 3.0, ISBN 978-1-77251-076-8

### Course Outcomes

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

- Describe lubrication principles and identify types of bearings and their lubrication requirements.
- Apply knowledge of pumps and compressors to plant operations and describe their operation and maintenance requirements.
- Identify various boiler safety devices and describe their purpose and operation.
- Apply plant operation and management principles to the safe startup, operation, and shut down of boilers and auxiliary equipment.
- Identify common tools used in energy plant maintenance and describe their safe usage.
- Explain the necessity for boiler cleaning and maintenance and describe common procedures used in cleaning and maintaining boilers.
- Describe internal and external boiler water treatment methods and testing procedures, and explain the need for boiler water treatment.
- Describe plant water treatment methods and testing procedures, and explain the need for such treatment.

## 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%



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 the importance of lubrication and the principles concerned with lubrication.
2. Describe bearing types, methods for care and maintenance of bearings, and bearing lubrication systems.
3. Describe the construction and operating principles of various types of pumps used in plants.
4. Describe the major considerations and procedures for pump operation and maintenance.
5. Describe the operating principles of the different types of compressors.
6. Describe the major considerations and general procedures for compressor operation and maintenance.
7. Explain the code requirements, design, and operation of pressure relief valves for power boilers, heating boilers, and pressure vessels.
8. Explain the design and operation of combustion safety controls on burners and boilers.
9. Describe feedwater devices and control methods used on boilers.
10. Relate the code, operation, and required fittings to the operating principles of fittings found on boilers.
11. Describe the operating and safety controls found on boilers.
12. Describe the operational procedures related to starting up auxiliary equipment in a boiler plant.
13. Describe procedures for safety starting boiler systems.
14. Describe operational procedures related to operating boilers.
15. Describe operational checks for operating boiler plants.
16. Describe generic shutdown and layup procedures for different boiler types.
17. Describe the points and readings that need to be monitored and recorded in a plant.

18. Describe the safe use of common hand tools in the powerhouse.
19. Discuss and describe the safe and proper setup of equipment for hoisting and working above ground.
20. Describe the service and maintenance required for boilers.
21. Discuss general procedures for inspections and mechanical and chemical cleaning of boilers.
22. Describe the general principle, methods and equipment used in preparing raw feedwater for steam production.
23. Describe the general principles, methods, and equipment used for internal boiler water treatment.
24. Discuss the general principles, methods, and equipment used for the treatment of condensate.
25. Discuss the general principles, methods, and equipment used for the treatment of condenser water and their effects on the cooling tower.
26. Describe recirculating water systems, their effects, treatment, and tests.