**Comprehensive 4th Class Power Engineering**

Fall 2022

## PECO 4400 Steam Generation
*4 credits, 4 weeks*

Areas covered are types of prime movers and heat engines, plant auxiliary systems, basic concepts of compression and absorption refrigeration, HVAC fundamental for facility operators, building environmental systems and controls, and typical industrial plant configurations 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).

## Program Faculty

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## Support Staff

Donna Villa, Power Engineering Program Coordinator – Powerprocess@keyano.ca

Melissa Coish, Program and Operations Coordinator – Melissa.Coish@keyano.ca

## Office hours

As per request from students, instructors are available outside of instructional hours. Please arrange a time with your instructor.

## Classroom Hours of Instruction
*Monday – Friday – 9:00am – 4:00pm*

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

Power Engineering Fourth Class (Textbook), Part B PanGlobal, Edition 3.5, 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 978-177251108-6

## Course Outcomes

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

- Identify and describe types of prime movers and heat engines including steam turbines, gas turbines, and internal combustion engines, and discuss their use in the Power Engineering field.

- Describe typical industrial building lighting, water, and drainage systems.

- Explain basic compression and absorption refrigeration systems and describe refrigeration control and operation.

- Discuss commonly used HVAC equipment including air conditioning, humidification, fans, air filters, coils and distribution.

- Describe building environmental systems and control in relation to Power Engineering.

- Discuss building heating systems, gains and losses, heat recovery methods, and control strategies.

- Identify the types of plants that employ Power Engineers and discuss their typical configurations.

## Evaluation
*The minimum standard for passing all S & E exams and the overall course is a grade of **65%**.*

Chapter and Unit Quizzes……………….10%

Section Test 1……………………………15%

Section Test 2……………………………15%

E – Exam…………………………………60%

Total………………………………………100%

## Learning Outcomes

1.  Discuss the historical conversions of heat energy into mechanical energy.

2.  Describe the construction and operation of steam turbines.

3.  Explain the operation and maintenance requirements of condensers and cooling towers.

4.  Describe the application, startup, operation, and maintenance required for gas turbines.

5.  Understand the application, construction, and operation of internal combustion engines.

6.  Explain the various lighting systems and some of the basic design considerations for lighting a space.

7.  Explain the various water supply systems used in buildings.

8.  Describe the design and components of various drainage systems used in facilities.

9.  Explain the basic concept of refrigeration and refrigerants.

10. Describe the operating principles of compression refrigeration systems.

11. Describe the purposes and operating principles of refrigeration system operational and safety controls.

12. Explain the operating principles and maintenance of refrigeration systems.

13. Describe the operating principle, maintenance, and operation of absorption refrigeration systems.

14. Outline the potential hazards inherent to refrigeration plants, the CSA requirements intended to mitigate hazards, and typical responses taken in the case of a significant leak.

15. Explain the methods and techniques for condition air for plants and buildings.

16. Explain the equipment and principles of humidification.

17. Describe the air flow behavior and movement of air through distribution systems.

18. Describe the various ventilation systems, including various types of air filters used in these systems.

19. Understand the designs and components of duct systems used in HVAC applications.

20. Describe the various types and operation of coils used in HVAC systems.

21. Describe the components, operating principles, and maintenance procedures of steam heating systems.

22.    Describe the various designs, equipment, and operation of hot water heating systems.

23.    Describe common heating systems encountered by Power Engineers.

24.    Explain central, unitary, and combined HVAC systems.

25.    Describe heat gains and losses, and common methods for energy recovery.

26.    Explain the control system strategies used in HVAC systems.

27.    Identify steam-related processes employed in common hydrocarbon plants.

28.    Identify steam related processes in common energy intensive industries.

## Proposed Schedule
**See the class schedule, topics, and readings as attached. They can also be found in Moodle.**

***Please Note:***
Date and time allotted to each topic is subject to change.

## Performance Requirements and Student Services

### Student Responsibilities
It is your responsibility as a student to contact the Office of the Registrar to complete the forms for Withdrawal or Change of Registration, and any other forms.  Please refer to the list of important dates as noted in the Academic Schedule in the Keyano College credit calendar.  The Keyano College credit calendar also has information about Student Rights and Code of Conduct.  It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Code of Conduct Policies.

### Student Attendance
Class attendance is useful for two reasons.  First, class attendance maximizes a student's learning experience.  Second, attending class is a good way to keep informed of matters relating to the administration of the course (e.g., the timing of assignments and exams).  Third, this is a condensed course and any time missed will greatly affect your success.Ultimately, you are responsible for your own learning and performance in this course.

It is the responsibility of each student to be prepared for all classes.  Students who miss classes are responsible for the material covered in those classes and for ensuring that they are prepared for the next class, including the completion of any assignments and notes that may be due.

### Academic Misconduct
Students are considered to be responsible adults and should adhere to principles of intellectual integrity. Intellectual dishonesty may take many forms, such as:

- Plagiarism or the submission of another person's work as one's own;
- The use of unauthorized aids in assignments or examinations (cheating);
- Collusion or the unauthorized collaboration with others in preparing work;
- The deliberate misrepresentation of qualifications;
- The willful distortion of results or data;
- Substitution in an examination by another person;
- Handing in the same unchanged work as submitted for another assignment; and
- Breach of confidentiality.

The consequences for academic misconduct range from a verbal reprimand to expulsion from the College.  More specific descriptions and details are found in the Student Rights and Code of Conduct section of the Keyano College credit calendar.  It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Code of Conduct Policies.

In order to ensure your understanding of the concept of plagiarism, you must successfully complete the online tutorial found on ilearn.keyano.ca.  Then print the certificate, sign it, and show it to each of your instructors.  Your course work may not be graded until you show this signed certificate.

**Specialized Supports**
The Student Services Department is committed to Keyano students and their academic success. There are a variety of student supports available at Keyano. Due to the continuing situation with the Covid-19 pandemic, the offered support services will be implemented through a model to respond to the restrictions in force at the time. In-person and virtual services will be offered. All Alberta Health Services guidelines will be followed for in-person appointments.

All student services are available during Keyano business hours: Monday to Friday, 8:30-16:30.  The College is closed for statutory holidays.  If you require support outside of regular business hours, please inform the support service team, and we will do our best to accommodate your needs.

**Accessibility Services:** provides accommodations for students with disabilities.  Students with documented disabilities, or who suspect a disability, can meet with a Learning Strategist to discuss their current learning barriers and possible accommodations. Students who have accessed accommodations in the past are encouraged to contact us to request them for the semester. Please note that requesting accommodations is a process and requires time to arrange. Contact us as soon as you know you may require accommodations. For accessibility supports and to book an appointment, please contact accessibility.services@keyano.ca.

Accessibility Services also provides individual and group learning strategy instruction for all students, as well as technology training and supports to enhance learning. Meet with a Learning Strategist to learn studying and test-taking strategies for online classes. Schedule an appointment with the Assistive Technology Specialist to explore technology tools for learning. Book an appointment today by emailing accessibility.services@keyano.ca

**Wellness Services:** offers a caring, inclusive, and respectful environment where students can access free group and individual support to meet academic and life challenges. Mental Health Coordinators offer a safe and confidential environment to seek help with personal concerns. Students may access services virtually and in-person.

Wellness Services welcomes students to participate in any of the group sessions offered throughout the academic year addressing topics including mindfulness and test anxiety.

Individual appointments can be made by emailing wellness.services@keyano.ca.

**Library Services:** provides students with research and information supports as they engage in their studies. Library staff are available to support you both online and in-person throughout the semester. For a detailed list of library supports and services, go to www.keyano.ca/library. For all inquiries, please email askthelibrary@keyano.ca or chat with us online.

Begin your research with the Library's FIND page. Search for information and sources for your assignments using the OneSearch, the Library's Catalogue, or by searching in a specific database selected from the A-Z Database List.

Individual support with us is available.  For support with citations, research and other information needs, appointments can be booked using the online Book A Librarian Calendar.  For support with Moodle, educational tools for assignments, Microsoft Office, Zoom, Teams and more, book an appointment using the online Educational Technology Support Calendar.

Research and subject guides are helpful resources when beginning your research, assignment, using new educational technology, or addressing other information needs. To view a subject or course-specific guide, check out the complete listing of online Subject Guides.

To access additional research resources, including Citation Guides (APA, MLA, Chicago, or IEEE), go to the Research Help Library page.

The Loanable Technology collection is available to support students in their learning pursuits, whether online, in person or both.  Items available for borrowing include mobile projectors, webcams, noise-cancelling headphones, Chromebooks, and laptops. For an up-to-date list of technology available for borrowing as well as support available, go to the Library's Loanable Technology webpage.

**Academic Success Centre:** The Academic Success Centre is a learning space in the Clearwater Campus (CC-119) at Keyano College. Students can gather to share ideas, collaborate on projects, get new perspectives on learning from our Academic Content Specialists, or use the Centre's educational resources. The Academic Success Centre provides academic support services to students registered in credit programs at Keyano College in the form of individual tutoring, writing support groups, facilitated study groups, workshops, and study space. Services are **free** to Keyano students.

Academic Content Specialists are available in the areas of Math, Science, Human Services, and English/Humanities.  This covers all courses offered at Keyano.  The Academic Success Coach can also be found in the Academic Success Centre.

For the most up to date information on how to book a session, please view Academic Success Centre homepage.

**Academic Integrity:** The goal of the Academic Success Centre is to foster a student's ability to learn effectively and independently. Students registered at Keyano College are welcome to drop by the Centre to visit with any of our Academic Content Specialists to discuss their academic concerns.

**Availability:** Monday to Friday: 8:30 – 16:30.  Flexible times may be available upon request. Virtual and in-person sessions, please email to get in contact with our Academic Content Specialists.  For the most up to date information on how to book a session, please view the Academic Success Centre homepage.

**Academic Success Coach:** offers you support and access to resources for your academic success to help you to find the Keys to your Success.  The Academic Success Coach will work with you to develop an academic success plan, develop your study and time management skills, and connect you with the right resources here at Keyano.  academic.success@keyano.ca is the best way to access resources during blended service delivery. The Academic Success Coach is located in the Skill Centre in CC-119 at the Clearwater Campus.

**E-Learning**
Technology and internet will impact your online learning experience. It's important that you can watch an online video and other course materials, take online quizzes and participate in a live class with your instructor and other students.  Live/virtual classes will be hosted in Microsoft Teams or Zoom.

For all course delivery types, you will access your course resources on Keyano's learning management system, **Moodle (iLearn).** Login in using your Keyano username and password.

Keyano College operates in a Windows based environment, and having the correct tools for online learning is important.  Here's a list of recommended system requirements.

**Internet Speed**
Minimum Internet speeds of 10 Mbps.

Recommended Internet speeds of 25 Mbps (especially if you are sharing your internet at home).

Check your internet speed with Fast.com.

**System requirements:**

| Microsoft Windows | Apple |
|---|---|
| **Minimum Requirements:**<br><br> A Windows 10 **computer/laptop**<br>·    Minimum 4GB of RAM.<br><br>·    10GB+ available hard drive storage.<br><br>·    Enough available hard drive space to install the Microsoft Office suite (approximately 3GB). Microsoft Office software is free to all Keyano students and employees.<br><br>·    Microphone, webcam and speakers.  A headset with a microphone is recommended.<br><br>·    System updates must be regularly installed.<br><br>·    Anti-Virus / Anti-Malware software | **Minimum Requirements:**<br><br> A Macintosh (V10.14 and above) **computer/laptop**<br>·    Minimum 4GB of RAM.<br><br>·    10GB+ available hard drive storage.<br><br>·    Enough available hard drive space to install the Microsoft Office suite (approximately 3GB). Microsoft Office software is free to all Keyano students and employees.<br><br>·    Microphone, webcam and speakers.  A headset with a microphone is recommended.<br><br>·    System updates must be regularly installed.<br><br>·    Anti-Virus / Anti-Malware software. |
| **Recommended Requirements**<br>·    8GB of RAM<br><br>·    A method of backing up/synchronizing to local or cloud-based storage such as OneDrive is highly recommended. This is included if you complete the setup of KeyanoMail and download MS Office using your Keyano email for free. | **Recommended Requirements**<br>·    8GB of RAM<br><br>·    A method of backing up/synchronizing to local or cloud-based storage such as OneDrive is highly recommended. This is included if you complete the setup of KeyanoMail and download MS Office using your Keyano email for free. |
| Chromebooks are **not** recommended as they are not compatible with testing lockdown browsers.<br><br>A Microsoft Surface or iPad or iPad Pro may be possible alternatives in some program areas. ||

**Specific Department Requirements:**
Business and OA programs require Windows 10.
Other programs may utilize Windows based tools as well.

**Computer Software**
Students will be able to get access to Microsoft Office 365 for free using Keyano credentials by clicking here.

**Recording of Lectures and Intellectual Property**

Students **may only record a lecture if explicit permission is provided by the instructor**. Even if students have permission to record a lecture or lecture materials, students will not share, distribute, or publish any of the lectures or course materials, this includes any recordings, slides, instructor notes, etc. on any platform. Thus no student is allowed to share, distribute, publish or sell course related content (instructor, or students) without permission. It is important to recognize that the Canadian Copyright Act contains provisions for intellectual property.
The Academic Integrity Policy provides additional information on Keyano College's expectations from students as members of the intellectual community.

**ITS Helpdesk**

If you are having issues with your student account, you can contact the ITS Helpdesk by emailing its.helpdesk@keyano.ca or calling 780-791-4965.