

**Process Operations: Co-op**

**Fourth Class**

Year 2, Term 1

## **PROC 103 Steam Generation**

*4 credits, 4 weeks, 120 hours*

Course includes prime movers and engines, pumps and compressors, lubrication, electricity, controls, instrumentation and computers, heating boilers, and heating systems as identified in the Alberta Boilers Safety Association Reference Syllabus for 4th Class Part B Power Engineering.

**Prerequisite:** Completion of 4<sup>th</sup> class Part A theory or 4A ABSA

**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**

John Cook (Chairperson)  
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## **Office hours**

As per request from students, instructors are available outside of instructional hours.

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

Power Engineering Fourth Class (Textbook), Part A1 PanGlobal, Edition 2.5, ISBN 978-1-897461-27-3

Power Engineering Fourth Class (Workbook), Part A1 PanGlobal, Edition 2.5, ISBN 978-1-9-897461-32-7

Academic Supplement, PanGlobal, 2009 Edition, ISBN 978-1-897143-13-4

2007 ASME Boiler & Pressure Vessel Code, An International Guide, Academic Abstract American Society of Mechanical Engineering, 2007 Edition, ISBN 978-1-897461-24-2

## Course Outcomes

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

- Apply knowledge to generalize procedures in the start-up, shut down and monitoring of operating turbines and engines.
- Apply knowledge of pumps and compressors to the operation and maintenance of equipment.
- Apply principles of lubrication to safe and efficient operation of equipment.
- Describe and give examples of basic electrical principles and devices.
- Troubleshoot process upsets or equipment failures due to problems involving instrumentation and controls.
- Differentiate between the processes and code requirements for steam and hot water heating boilers.
- Describe and troubleshoot the distribution of heat from heating systems into buildings.

## Evaluation

Students will be graded using percentage scales.

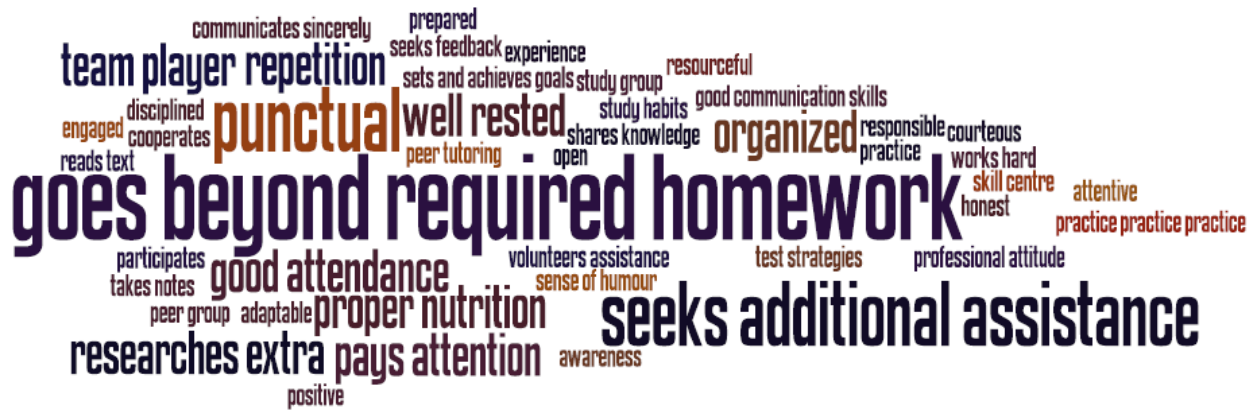
Category	Weight
Section "S" Test	20%
Section "S" Test	20%
"E" Exams	35%
Workbook	15%
Moodle Chapter & Unit Quizzes	10%
<b>Total Grade</b>	<b>100%</b>

*The minimum standard for passing all S & E exams and the overall course is a grade of 65%. In addition, a **PASS** mark for completion of six month work experience co-op is required.*

## Performance Requirements

Technical training is considered an extension of the workplace in terms of attendance and punctuality. It is expected that students will manage their time in accordance with the published program schedule and will attend all classes. Students shall not exceed four days absenteeism during year one, term one which is the four month theory based training period.

## 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 study group purposes. The SKILL Centre is for “support” not to “teach” you course content due to lack of attendance.

	<b>Monday - Friday</b>
<b>Monday to Friday</b>	<b>8:30 – 4:30</b>

Additional evening & weekend tutorial hours will be posted in the Skill Centre or please contact [skill@keyano.ca](mailto:skill@keyano.ca) to confirm tutoring availability.

**Academic Regulations**

Refer to page 26-40 of the Keyano College 2013-2014 Credit Calendar or use this link to view Keyano College's [Academic Regulations](#):

**Keyano College Student Rights and Responsibilities:**

It is the student's responsibility to read the Student Rights and Responsibility Policy document found in the Keyano College Credit Calendar 2013-2014, pages 36-40. The information contained in this policy should guide the student's conduct while attending Keyano College. Below are a few "Highlights" to note:

**Student Rights:** The student has the right to:

- reasonable freedom of opinion and expression in the classroom, in assignments, and in exams, where course content allows.
- confidentiality of his/her personal records.
- proper and impartial evaluation of his/her performance and the right to request a re-evaluation within time lines and procedures established by the College.
- freedom from being subjected to physical, verbal, mental, or sexual harassment including any indignity, injury, violence or unfair accusation.

**Student Responsibilities:** The student has the responsibility to:

- respect the rights of ALL others. Respect is earned.
- refrain from threatening to subject or subjecting any person to physical, verbal, mental, or sexual harassment including any indignity, injury, violence or unfair accusations.
- respect the faculty member's right to determine course methodology, evaluation, right to set deadlines for assigned work, and to establish penalties for failure to comply with deadlines.
- refrain from unduly disturbing, disrupting or otherwise interfering with studies, laboratories, lectures, work or other activities of fellow students or staff.
- know the consequences of plagiarism, fraud, deceit, and/or other forms of academic and non-academic dishonesty.
- not openly share marks and other confidential information/material in the classroom.

**Instructor Responsibilities:** The instructor has the responsibility to:

- establish, post and enforce classroom ground rules to promote the student learning experience. This may include the promotion and application of electronic devices for learning purposes. If abused, then this privilege may be taken away.
- accommodate students with different learning styles and disabilities.
- be prepared and committed to effective time management and relevance of theory and application.
- be actively available, and maintain a physical presence in the classroom in order to monitor student learning in a timely manner.
- address student concerns encountered with Moodle test bank.
- acknowledge student diversity and treat ALL students with respect. Respect is earned.
- enhance the classroom learning environment by incorporating actively engaging activities, arranging relevant lab/shop tours, utilizing posters/visuals/manipulatives and sharing of relevant experiences. Remind students the classroom reflects a typical work site, thus is not a democracy (i.e. cell phones, breaks, etc.).
- exercise discretion with regards to student attendance and tardiness.
- ensure examinations are fair and align with student learning outcomes.

## Teaching & Learning Methodologies

This course is delivered in a classroom setting, supplemented by online testing through iLearn/Moodle; <http://ilearn.keyano.ca> **Please note:**

- iLearn/Moodle will be used for ongoing assessment purposes. Please be patient and bring questions/concerns regarding the test bank to your instructor.
- 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 “kick” 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.**
- iLearn/Moodle quizzes will be released by instructor as per course instruction schedule. Consideration will be given for exam preparation 2 days prior to exams.

This course is also supplemented by **Mentor 3D**; [www.mentor3D.keyano.ca](http://www.mentor3D.keyano.ca) which is an online, interactive 3D animation program to support student learning of some program concepts and procedures. Access to this technology is not automatic and requires student registration and password access which may be available upon request to the instructor. Access may take up to 48 business hours to process.

In addition, applicable **lab tours** will be planned to enhance the student learning experience, when opportunities exist.

## Specialized Supports & Duty to Accommodate

### **Disability Support Services: Learner Assistance Program (LAP):**

If you have a documented disability or you think that you would benefit from some assistance from a Disabilities Counsellor, please call or visit the Disability Supports Office 780-792-5608 to book an appointment (across from the library). Services and accommodations are intended to assist you in your program of study, while maintaining the academic standards of Keyano College. We can be of assistance to you in disclosing your disability to your instructor, providing accommodations, and supporting your overall success at Keyano College.

### **Specialized Supports and Duty to Accommodate:**

Specialized Support and Duty to Accommodate are aligned with the office of Disability Support Services: Learner Assistance Program (LAP) guided by federal and provincial human rights legislation, and defined by a number of Keyano College policies. Keyano College is obligated by legislation to provide disability-related accommodations to students with identified disabilities to the point of undue hardship.

**Please Note:** 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)

## Learning Outcomes

1. Discuss the terms used in describing the conversion of heat into mechanical energy and to describe one such device for accomplishing this, the simple steam engine.
2. Describe the construction and operation of steam turbines
3. Describe the operation and maintenance of cooling towers.
4. Describe the construction and operation of a simple gas turbine.
5. Describe the application, construction, and operation of internal combustion engines.
6. Describe the design and operating principles of various types of pumps used in buildings and industrial plants.
7. Describe the major considerations and procedures for pump operation and maintenance.
8. Describe the operating principles of the different types of air compressors.
9. Describe the importance of lubrication and the principles concerned with lubrication.
10. Describe the Methods for simple care and maintenance of bearings and their related lubrication systems.
11. Describe the concepts of basic electricity and perform simple calculations using voltage, current, resistance and power.
12. Describe the basic principles of magnetism.
13. Discuss the designs and uses of electrical metering devices.
14. Describe the operating principles of the various types of AC and DC motors or generators.
15. Describe the operating principle of transformers.
16. Describe an electrical distribution system.
17. Describe the overall purpose and function of plant instrumentation systems.
18. Describe the construction and operation of common devices used to measure pressure, level, temperature, flow and composition.
19. Describe the basic types and functions of transmitters, recorders, controllers and control valves.
20. Describe specific types of instrumentation and controls used on boilers.

21. Describe the operation of programming controls for boilers and discuss testing and maintenance procedures for these controls.
22. Describe the major components of process computers, their basic functions and the types of tasks performed by the computer systems.
23. Describe cast iron boilers and explain their uses.
24. Describe the various oil burners used on heating boilers.
25. Describe the operation of the various types of gas burners used on heating boilers.
26. Describe and explain the operating principles of pressure gages and safety valves found on low-pressure steam boilers.
27. Describe the purpose and operating principles of basic boiler fittings on hot water boilers.
28. Describe the specific safe and efficient operational procedures that relate to automatically-fired, low pressure hot water and steam heating boilers.
29. Describe the components and operating principles of steam heating equipment.
30. Describe the operating principles and maintenance procedures of steam heating systems and the components of these systems.
31. Describe the various designs of hot water heating systems
32. Describe accessories, operation and troubleshooting of a hot water heating system.
33. Describe the operating principles of warm air heating systems.
34. Describe the components and maintenance requirements of typical warm air heating and ventilating systems.
35. Describe the various ventilation systems found in buildings, as well as describe the various types of air filters used in these systems
36. Describe infrared and electric heating systems.



**Authorization:**

This course outline has been authorized by the following individuals:

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Instructor(s)

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John Cook (Department Chair Person)

Course Outline Effective Date: -----