

Process Operations: Co-op

Fourth Class

Year 1

## **PROC 104 Prime Movers and Auxiliaries**

*4 credits, 4 weeks, 120 hours*

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.

### **Instructors**

Alan Block

780-791-4895

[Alan.Block@keyano.ca](mailto:Alan.Block@keyano.ca)

Office#: BL 162

Nuwan De Alwis

780-792-5113

[Nuwan.Dealwis@keyano.ca](mailto:Nuwan.Dealwis@keyano.ca)

Office#: BL 161

Rifat Dyrmishi

780-792-2681

[Rifat.Dyrmishi@keyano.ca](mailto:Rifat.Dyrmishi@keyano.ca)

Office#: BL 155

Brian MacDougall

780-792- 5635

[Brian.MacDougall@keyano.ca](mailto:Brian.MacDougall@keyano.ca)

Office#: BL 159

Corinne Parker

780-792-5724

[Corinne.Parker@keyano.ca](mailto:Corinne.Parker@keyano.ca)

Office#: BL 151

Robert Marsh

780-792-5130

[Robert.Marsh@keyano.ca](mailto:Robert.Marsh@keyano.ca)

Office#: BL 153

Gallage De Silva

780-792-5744

[Gallage.DeSilva@keyano.ca](mailto:Gallage.DeSilva@keyano.ca)

Office#: BL 157

Rahul Ponde

780-792- 5126

[Rahul.Ponde@keyano.ca](mailto:Rahul.Ponde@keyano.ca)

Office#: BL 158

### **Office hours**

Instructors are available outside of instructional hours upon request from student.

**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

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

**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:

- 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

Students will be graded using percentage scales.

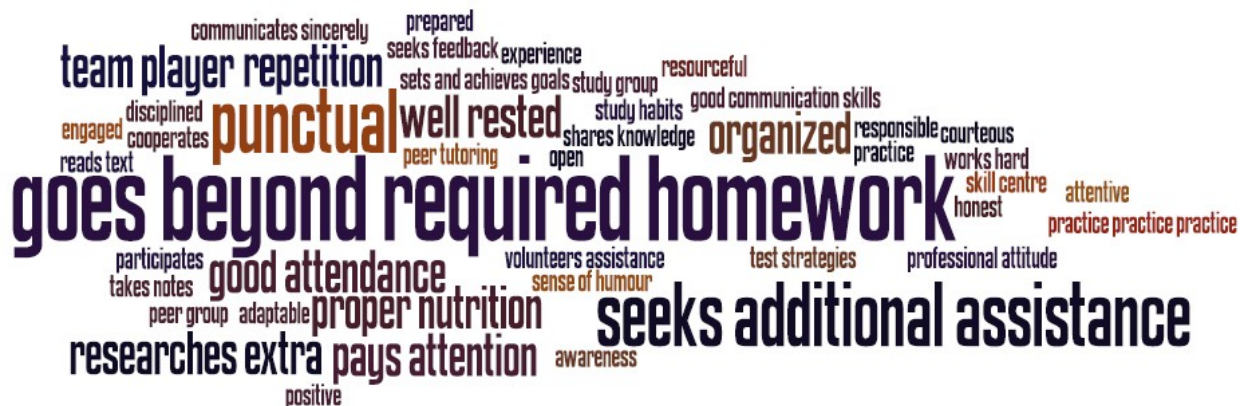
Category	Weight
Section "S" Test	20%
Section "S" Test	20%
"E" Exams	40%
Moodle Chapter & Unit Quizzes	20%
Total Grade	100%

*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>9:00 - 4:00</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 pages 25 & 26 of the Keyano College 2017-2018 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 2016-2017, pages 34-37. 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 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.