

Process Operations: Co-op
Fourth Class
Year 2, Term 1

PROC 104 Prime Movers and Auxiliaries

4 credits, 4 weeks, 120 hours

Topics include heating boiler and heating system controls, auxiliary building systems, vapour compression refrigeration, absorption refrigeration, air conditioning, air conditioning systems, boiler maintenance and types of plants as identified in the Alberta Boilers Safety Association Reference Syllabus for 4th Class Part B Power Engineering.

Prerequisite: Completion of 4th class Part A theory or 4A ABSA

Instructors

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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)

4B2 Power Engineering Fourth Class (Textbook), PanGlobal, Edition 2.5, ISBN 978-1-897461-30-3

4B2 Power Engineering Fourth Class (Workbook), PanGlobal, Edition 2.5, ISBN 978-1-897461-35-8

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

2007 ASME Boiler & Pressure Vessel Code, An International Guide, American Society of Mechanical Engineering, 2007 Edition, ISBN 978-1-897464-24-3

Course Outcomes

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

- Identify, describe and be prepared to operate, the control systems of heating boilers safely.
- Differentiate and describe the different types of lighting, water and drainage systems used in auxiliary buildings.
- Identify and describe the thermodynamics and components of compression and absorption refrigeration systems.
- Identify and describe the scientific principles of, and components used in, air conditioning and air conditioning systems.
- Explain the basic tools and safety procedures required for efficient boiler maintenance.
- Assess boiler deficiencies to determine the maintenance and cleaning required for safe and efficient operation.
- Distinguish processes utilized in various types of industries requiring power engineers.

Evaluation

Students will be graded using percentage scales.

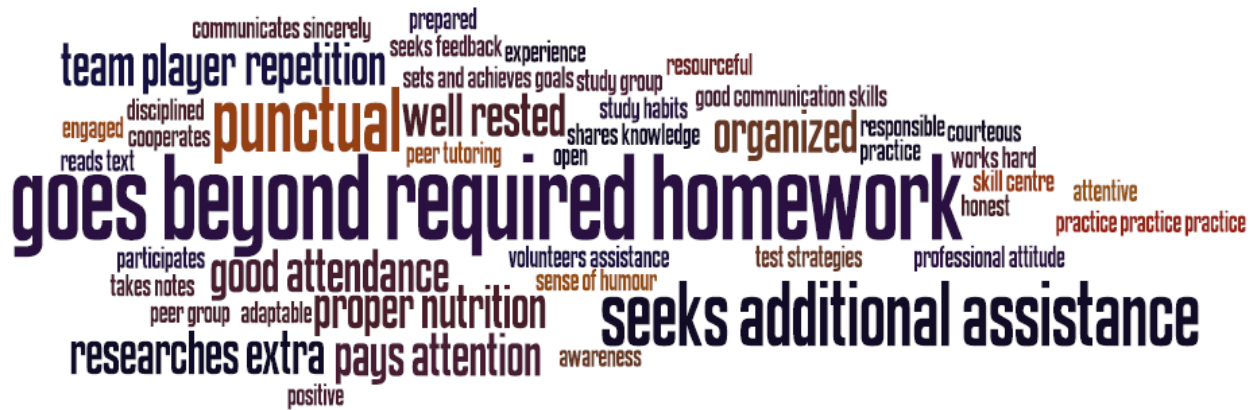
Category	Weight
Section "S" Test	20%
Section "S" Test	20%
"E" Exams	35%
Workbook	15%
Moodle Chapter & Unit Quizzes	10%
Total Grade	100%

*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.

	Monday - Friday
Monday to Friday	8:30 – 4:30

Additional evening & weekend tutorial hours will be posted in the Skill Centre or please contact 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 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

www.keyano.ca

Learning Outcomes

1. Describe the various feedwater control methods and devices used on low-pressure steam boilers.
2. Name and describe the various operating controls found on low-pressure heating boilers.
3. Explain the design and operation of various combustion controls on heating boilers.
4. Explain the purpose of the various components found in a pneumatic control system.
5. Describe and explain the various components of an electric control circuit.
6. Describe and explain the function of the various components of an electronic control circuit.
7. Explain the various lighting systems and some of the basic design considerations for lighting a space.
8. Explain the various water supply systems used in buildings.
9. Describe the design and components of various sanitary drainage systems used in buildings.
10. Explain the terms and principles associated with the thermodynamics of refrigeration.
11. Describe the different refrigerants and explain the classification and various properties of each refrigerant.
12. Describe the operating principles of compression refrigeration systems.
13. Describe the operating principles and the components of refrigeration compressors.
14. Describe the different types of heat exchangers used in refrigeration systems.
15. Describe the purpose and operating principles of the operational and safety controls on a refrigeration system.
16. Describe the operating principles of refrigeration metering devices and capacity controls.
17. Describe the various accessories used in refrigeration systems.
18. Describe the various operation and maintenance procedures used on compression refrigeration systems.
19. Describe the various operation and maintenance procedures used on compression refrigeration systems.
20. Describe the operating principle of the absorption refrigeration systems.

21. Describe the various operation and maintenance procedures used on absorption refrigeration systems.
22. Describe the psychrometric properties of air.
23. Solve problems using a psychrometric chart.
24. Describe the air flow behaviour and movement of air through distribution systems.
25. Describe the designs and components of duct systems used in air conditioning.
26. Describe the various types of coils used in air conditioning systems.
27. Describe the operation of the various types of coils used in air conditioning systems.
28. Explain the equipment and principles of humidification.
29. Describe the operation of various air conditioning systems.
30. Describe the design and operation of combined air conditioning systems and explain the factors to consider when selecting an air conditioning system.
31. Explain the purpose, design and operation of heat recovery in air conditioning systems.
32. Describe the control systems used in air conditioning.
33. Describe the various ways a building gains and loses heat.
34. Describe the safe use of common hand tools in the powerhouse.
35. Discuss and describe the safe and proper setup of equipment for hoisting and working above ground.
36. Discuss the designs and safe applications and attachment of lifting cables and ropes and the designs and uses of metal fasteners.
37. Describe the service and maintenance required for boilers.
38. Discuss the procedure for preparing a boiler for inspection and cleaning and describe mechanical and chemical boiler cleaning methods.
39. Discuss the basic design of a hot oil system and the requirements for the safe operation of a direct fired heater.
40. Describe the basic equipment and processes used in the treatment of natural gas and in the production of pulp and paper.
41. Identify steam related processes in food processing plants, sawmills, and oil refineries.

Authorization:

This course outline has been authorized by the following individuals:

Instructor(s)

John Cook (Department Chair Person)

Course Outline Effective Date: -----