GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Power Engineering Program

COURSE SYLLABUS - SEMESTER II

POWER ENGINEERING II: PN 1155

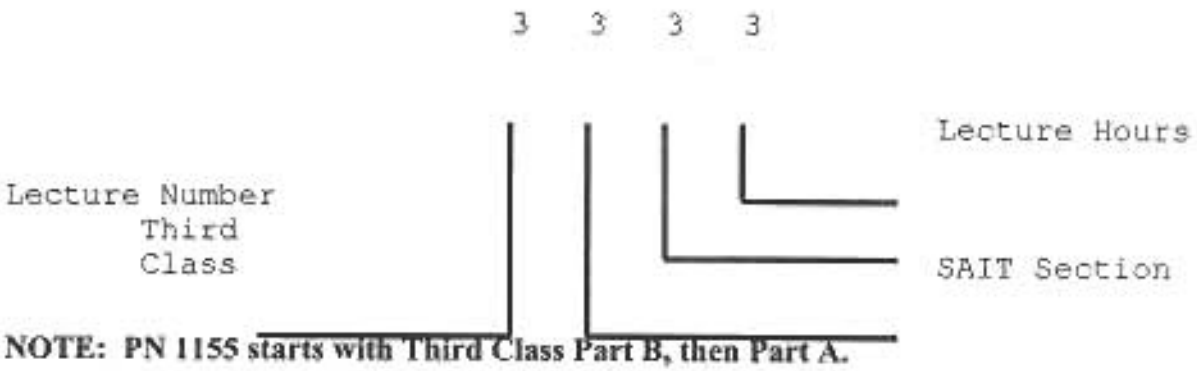
Continuation of the topics covered in PN 1055 at a greater depth, preparing the graduate to challenge the Provincial Government Third Class exams (A).

Prerequisite: PN 1055

Textbooks: *Power Engineering 3rd Class*, S.A.I.T.

Class Hours: See Timetable

Class: Reference Material Source and Lecture Time



NOTE: PN 1155 starts with Third Class Part B, then Part A.

Course Objectives

Unit 1: Basic Chemistry and Engineering Materials 3.1.10.4

Upon the successful completion of this unit, the student will be able to:

1. describe what elements, compounds, and mixtures are; as well as understanding chemical equations and know how to balance them.
2. describe the structure of an atom and how to determine its mass.
3. describe what acids, salts, and bases are; as well as carbon compounds.
4. describe the mechanical properties found in materials used in power plants.

5. describe the different types of materials used in power plants.

Unit 2: Fire Protection and Plant Safety 3.2.1.3

Upon the successful completion of this unit, the student will be able to:

1. describe fire protection.
2. describe the classes of fires and the methods used to extinguish a fire.
3. describe fire precautions in the work place.
4. describe the types of accidents that occur in the work place and what to do when an accident does occur.
5. describe the purpose of safety equipment as used for the following purposes:
   - personnel
   - equipment in the plant
   - electrical
6. describe artificial respiration.
7. describe radiation devices and their materials. to understand the purpose of the safety committee.

Unit 3: Industrial Legislation and Code Calculations 3.2.2.12

Upon the successful completion of this unit, the student will be able to:

1. describe the Alberta Safety Code Act And Regulations (pressure).
2. describe the Canadian Standards Association B-51.
3. describe the Canadian Standards Association B-52.
4. describe ASME section vii recommended rules for the care of power boilers.
5. conduct ASME code section i calculations on pressure and thickness of boiler parts.

Unit 4: Piping 3.2.6.4

Upon the successful completion of this unit, the student will be able to:

1. describe the materials used in piping and the effect temperature and thickness have on the strength of these materials.
2. understand commercial pipe sizes and fittings.
3. describe the methods used in connecting piping including screwed, flanged and welded connections.

4. describe various types of valves used in piping systems and explain their operation.

5. describe the correct pipe installation including expansion, contraction, support and insulation.

6. describe the importance of proper piping drainage.

7. gain a working knowledge of steam separators, steam traps and strainers.

8. describe insulating materials.

Unit 5: Electrical Machines I (Operation and Maintenance) 3.2.8.5 (Refer Electric Circuits and Machines, Lister)

Upon the successful completion of this unit, the student will be able to:

1. describe the principle of operation of direct current machines.

2. describe the construction details of direct current machines.

3. describe and calculate EMF, back EMF, armature reaction and efficiency for direct current machines.

4. describe testing and maintenance of direct current machines.

5. describe direct current generator types and their characteristics.

6. describe direct current motor types and their specific characteristics, along with starting, stopping, and practical applications.

Unit 6: Electrical Machines II (Operation and Maintenance) 3.2.9.5 (Refer Electric Circuits and Machines, Lister)

Upon the successful completion of this unit, the student will be able to:

1. describe the construction and function of transformers used for electrical purposes, including step-up and step-down, current and instrument transformers. ratio of primary and secondary turns, voltages and currents, as well as the advantages of using transformers in power transmission.

2. describe the purpose of alternators, types of rotors used, including three phase and single phase windings, star and delta coil connections, as well as the necessary steps when paralleling or synchronizing alternators and methods used.

3. describe motor components, how induction motors are constructed, the principle of operation, what is meant by "slip speed". the construction and the advantages and disadvantages of synchronous motors.

4. describe five different starting methods used to reduce current and voltage during start-up minimizing undesirable effects.
5. describe the basic rules of maintenance on rotating ac machines for safe and efficient operation of this equipment.

6. lab assignment: students will review lab equipment and be able to demonstrate an understanding of electrical devices.

7. describe electron theory, measuring current voltage and resistance.

8. describe protective equipment.

Unit 7: Electrical Applications

Upon the successful completion of the unit, the student will be able to:

1. describe D.C. metering principles, instruments for testing electrical equipment, and performing electrical maintenance. The student will be able to explain the principles of D.C. Galvanometers and make a simple sketch showing the basic parts.

2. describe the use and construction of D.C. Ammeters, D.C. Voltmeters and Ohmmeters.

3. describe metering principles, including multimeters. Also to know the construction and basic components of the wattmeter and its application in the field of electrical measurement.

4. describe the importance, function, and application of relays in most types of industry for control and protection of various equipment.

5. describe the dangers when operating or repairing electrical equipment, to practice and know the basic safe working habits, have a basic knowledge of trouble shooting and be able to determine some of the faults of electrical equipment.

6. Lab Assignment: Use lab electronic simulators with multimeters to demonstrate an understanding of electrical circuits.

Unit 8: Types of Plants 3.2.13.3

Upon the successful completion of this unit, the student will be able to:

1. describe the electrical generation other than thermal generation.

2. describe thermal electric generation as applied to an operating cycle.

3. describe the processes used in natural gas treatment plants.

4. describe the processes used in pulp and paper plants.

Unit 9: Controls and Instrumentation 3.2.15.5

Upon the successful completion of this unit, the student will be able to:

1. understand the purpose of control and monitoring systems.
2. describe various scales, gauge, absolute, and vacuum that are used to determine pressure. also be able to determine pressure due to head of various liquids.
3. understand low water fuel cut-off devices.
4. understand feedwater systems.
5. describe the various instruments used to measure pressure.
6. describe different equipment and principles used in level measurement.
7. describe the methods used to measure the flow rate of steam, feedwater, fuel and air for same efficient operation of the steam plant.
8. describe packaged boiler systems.
9. describe the different principles used to measure temperature.

Evaluation

Final Exam	35%
Midterm	35%
Quizzes and Assignments	30%

Summary of PN1155 (Part A) Course Hours

Lecture	126 hours
Quizzes/Assignments (5)	12 hours
Midterm	3 hours
Total	141 hours

Lectures given as per timetable include: instruction with overhead views, video presentations, assignment reviews, and assignment time with opportunity for individual assistance (as time permits).