DEPARTMENT OF HEAVY EQUIPMENT PROGRAMS

COURSE OUTLINE – WINTER SEMESTER 2

HE 2300 DIESEL FUEL INJECTION SYSTEMS – 5(80 HOURS/18 WEEKS) 25 LECTURE – 55 LAB/SHOP

INSTRUCTOR:	Gavin Winter	**PHONE:**	780 835 6695
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OFFICE HOURS: Monday to Friday

PREREQUISITE(S)/COREQUISITE: English 20-1, English 20-2 or equivalent

Math 20-1, Math 20-2, Math 20-3 or equivalent

A 20-level Science or equivalent

Although a high school diploma is not required for entrance to this program, students should be aware that some employers may require a High School Diploma as a prerequisite to employment.

Applicants who do not meet these requirements may be admitted to the program but they will be required to pass the Apprenticeship & Industry Training (AIT) Trades Entrance Exam during the first semester, if choosing to pursue an apprenticeship.

REQUIRED TEXT/RESOURCE MATERIALS: 1st and 2nd Period Heavy Equipment Technician ILM Modules

CALENDAR DESCRIPTION:

Handle and store diesel fuel using safe and efficient practices.
Apply the theory of the combustion process to engine operation and diagnosis.

Explain the operation of a basic fuel injection system. Service the fuel injection supply system. Service port/helix metering fuel injection systems. Perform fuel injector testing, removal and replacement. Service opposed plunger inlet metering fuel injection systems. Explain governor operation and adjustments. Perform fuel injector testing, removal and replacement. Explain the operating principles of engine shutdown and warning systems.

CREDIT/CONTACT HOURS: 5 Credits – 80 Contact Hours – 4 hours per week

DELIVERY MODE(S): Instructor led classroom theory (25 hours), instructor led lab/shop (55 hours)

OBJECTIVES (OPTIONAL): The program has been developed to provide students with entry level skills as a Heavy Equipment Technician. After obtaining a requisite number of hours in the work force, the student would be eligible to continue with Alberta Apprenticeship and Industry training in the Heavy Equipment Technician trade towards journeyman certification.

TRANSFERABILITY: None

GRADING CRITERIA: A grade of 65% or higher is required to pass this course. Students must complete all required courses with a grade point average of no less than 2.0 and no failing (F) grades.

GRANDE PRAIRIE REGIONAL COLLEGE			
GRADING CONVERSION CHART			
Alpha Grade	**4-point Equivalent**	**Percentage Guidelines**	**Designation**
A+	**4.0**	**90 – 100**	**EXCELLENT**
A	**4.0**	**85 – 89**	
A-	**3.7**	**80 – 84**	**FIRST CLASS STANDING**
B+	**3.3**	**77 – 79**	
B	**3.0**	**73 – 76**	**GOOD**
B-	**2.7**	**70 – 72**	
C+	**2.3**	**67 – 69**	**SATISFACTORY**
C	**2.0**	**65 – 66**	
F	**0.0**	**60 – 64**	**FAIL**
F	**0.0**	**55 – 59**	
F	**0.0**	**50 – 54**	
F	**0.0**	**0 – 49**	
WF	**0.0**	**0**	**FAIL, withdrawal after deadline**

EVALUATIONS:

Theory portion will be made up of quizzes and tests worth 35%.

Shop portion will be made up of shop projects worth 65%.

Students who have successfully completed the program and also completed an acceptable Alberta Apprenticeship Prior Learning Assessment Application (fee payable to Alberta Apprenticeship) may have the opportunity to challenge the Alberta Apprenticeship and Industry Training (AIT) first and second year Heavy Equipment Technician apprentice exam.

STUDENT RESPONSIBILITIES:

Please refer to the Student Rights and Responsibilities policy in the Grande Prairie Regional College Calendar or at www.gprc.ab.ca/downloads/documents/StudentRightsandResponsbilities.pdf

STATEMENT ON PLAGIARISM AND CHEATING:

Please refer to pages 49-50 of the College calendar regarding plagiarism, cheating and the resultant penalties. These are serious issues and will be dealt with severely.

COURSE SCHEDULE/TENTATIVE TIMELINE:

A. Diesel Fuel and Storage Tanks (Machine and Bulk Storage) ..... 4 Hours
Outcome: Handle and store diesel fuel using safe and efficient practices.
1. State the safety precautions, characteristics and properties of diesel fuel.
2. Explain diesel fuel storage concerns.
3. Identify construction requirements and design features of fuel storage and supply tanks.

B. Combustion Process and Starting Aids .....8 Hours
Outcome: Apply the theory of the combustion process to engine operation and diagnosis.
1. Explain the characteristics and factors affecting the diesel engine combustion process.
2. Explain diesel engine emission concerns.
3. Identify and state the purpose of common combustion chambers.
4. Identify types and function of common diesel engine starting aids.

C. Basic Fuel Injection System ..... 6 Hours
Outcome: Explain the operation of a basic fuel injection system.
1. List the requirements of a fuel injection system.
2. Identify the layout and components of a basic fuel injection system.
3. Explain the function of the components required in the basic diesel fuel injection system.

D. Fuel System Service .....12 Hours
Outcome: Service the fuel injection supply system.
1. Identify types and service procedures for common fuel filters.
2. Explain the operating principles and design features of common fuel transfer pumps.
3. Perform testing and diagnosis of a fuel transfer system.
4. Explain fuel transfer pump inspection and service procedures.

E. Port/Helix Metering Fuel Systems..... 14 Hours

Outcome: Service port/helix metering fuel injection systems.
1. Explain the principles of port and helix fuel metering.
2. Explain two methods of timing port and helix fuel injection pumps.
3. Describe emission controls used with port and helix injection pumps.

F. Opposed Plunger Inlet Fuel Metering Systems ..... 10 Hours
Outcome: Service opposed plunger inlet metering fuel injection systems.
1. Explain the principle of inlet fuel metering for opposed plunger pump designs.
2. Explain the basic methods of timing opposed plunger pumps.
3. Describe emission controls used with opposed plunger pumps.

G. Diesel Fuel Injector Fundamentals and Service .....12 Hours
Outcome: Perform fuel injector testing, removal and replacement.
1. Identify hydraulic fuel injector types and construction.
2. Explain the operating principles of hydraulic fuel injection nozzles.
3. Describe fuel injector removal and replacement procedures.
4. Explain hydraulic injector testing procedures.
5. Demonstrate the procedure to isolate a faulty fuel injector on a running engine.

H. Engine Governor Fundamentals and Service .....12 Hours
Outcome: Explain governor operation and adjustments.
1. State the functions of engine governors.
2. Explain standard governor terminology.
3. Explain governor operation according to design characteristics and application.
4. Explain causes and symptoms of basic engine governor malfunctions.
5. Explain governor adjustment limitations and adjustments.

I. Emergency Shut-Down Systems ..... 2 Hour
Outcome: Explain the operating principles of engine shutdown and warning systems.
1. Explain the operation of an engine emergency warning and shut down system that monitors oil pressure, coolant temperature, coolant level and engine over-speed.