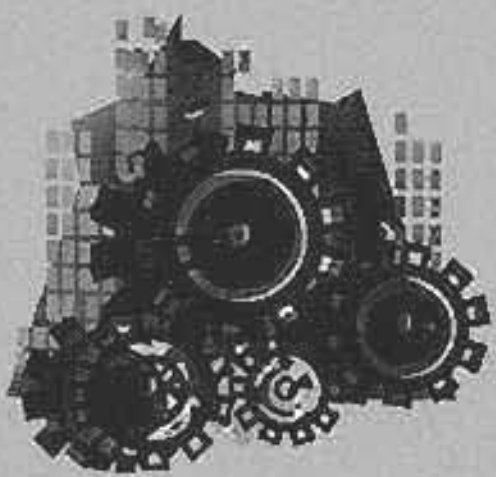
2000/2001

Industrial Maintenance Technician



APPROVED MAY 13, 1993
AMENDED AUGUST 1998
AMENDED JULY 2000

GPRC

INDUSTRIAL TRAINING PROGRAMS

CURRICULUM DOCUMENT

INDUSTRIAL MAINTENANCE TECHNICIAN PROGRAM

INTRODUCTION

The Grande Prairie Regional College, Industrial Training will offer a eight month program of studies in industrial maintenance to provide graduates with a well-rounded overview of the fundamentals of the design, construction and repair of industrial equipment. The program will incorporate a wide range of introductory courses followed by hands-on laboratories.

An integral part of the success of this program will be 4 weeks of work experience. Students will have the opportunity to apply their acquired knowledge and skills in the workplace. The benefits from contact with industry will enhance their career objectives.

Students who successfully complete the program will be eligible to challenge the first and second year Millwright Apprenticeship Exam. Graduates will also acquire certification in the safety courses required by industry.

As technology changes and advances, graduates will have to be diversified to gain or maintain employment. Students who are exposed to a wide range of experiences and technical information are more likely to be successful in gaining entry-level employment as an Industrial Maintenance Technician. Graduates will possess the theory, knowledge and practical skills that industry has identified in the Millwright Program Advisory Committee evaluation.

This document contains the program philosophy, mission and objectives that form the foundation of the curriculum for the proposed 32-week Industrial Maintenance Technician Program at Grande Prairie Regional College.

PHILOSOPHY

1. Industrial Maintenance Technicians are vital to the prosperity and well being of the nation.

2. All industrial maintenance will be completed in a safe and reliant manner.

3. The prevention of accidents and good safety procedures will be practised at all times.

4. Theoretical foundations and practical training will be enhanced in a controlled shop environment.

5. Problem solving and critical thinking will be part of the daily activities of an Industrial Maintenance Technician.

6. The program will be enhanced by relevant work experience in partnership with the community.

7. The program content will be reviewed on a regular basis to ensure relevance to industrial practices.

MISSION STATEMENT

The Industrial Maintenance Technician Program is designed to provide students with opportunities for developing the knowledge, skills and attitudes necessary for employment in industry as machinist or millwright apprentices, maintenance technicians, and manufacturing or sales representatives.

THE PROGRAM

Graduates from the program may work in any of the following areas: pulp and paper; sawmills; petrochemical plants; and petroleum, manufacturing and service industries. Graduates may work as part of a maintenance team in the daily maintenance and preventive maintenance of equipment involved operations. They will acquire the specific practical skills and techniques, problem solving concepts, and theoretical knowledge necessary to work in support positions with qualified journeymen. Safety concepts and attitudes will be entrenched in the work habits and work ethics of graduates. Upon successful completion of the program and employment, graduates upon recommendation of employer, will be eligible to challenge first and second year Apprenticeship Millwright Exam, receive a Grande Prairie Regional College certificate and certification for the following.

1. Standard First Aid Certificate
2. Cardiopulmonary Resuscitation (CPR)
3. Workplace Hazardous Materials Information Systems (WHMIS)
4. H_2S Alive
5. Confined Space Entry (optional)

PROGRAM OBJECTIVES

Upon completion of the Industrial Maintenance Technician Program, the graduate will:

1. demonstrate an awareness of, and concern for, good safety practices in the workplace.

2. display the knowledge, attitudes, and physical skills required for work as an apprentice Industrial Maintenance Technician.

3. exhibit respect and care for, the equipment that is utilized in the workplace.

4. understand the responsibilities that a maintenance person has towards preventive maintenance.

5. demonstrate critical thinking skills to troubleshooting, problem solving and diagnosing of equipment problems.

6. understand the fundamentals of design, production, and repair of equipment in an industrial setting.

ADMISSION CRITERIA

Selection of students for admission is based on the following criteria:

1. High school requirements:

   a. if you are entering the program directly from high school you will need a General High School Diploma including a minimum of 50 per cent in Mathematics 20 (or Applied or Pure Mathematics 20) or Mathematics 23, and Science 20 or Physics 20 (or their equivalents).

   b. if you do not have a high school diploma but have been out of school for at least one year you will need 50 per cent in English 30 or 33 (or the equivalent), **and** 50 per cent in Mathematics 20 (or Applied or Pure Mathematics 20) or Mathematics 23 **and** Science 20 or Physics 20 (or their equivalents).

2. qualified applicants will be required to attend an information session. Applicants will be required to bring a written career investigation report and be prepared to discuss their career aspirations. While admission to the program is primarily based on academic performance, individuals who do not attend the information session or complete the career investigation may be denied admittance into the program.

Certification in the following safety courses are required before the first day of December in the current year and must remain valid for one year.

- H_2S Alive
- Confined Space Entry (optional)
- Standard First Aid/Cardiopulmonary Resuscitation

The College will schedule and assist in offering the above courses.

Approved October 9, 1998

CURRICULUM OVERVIEW

SEMESTER I

COURSE		CREDITS	IN CLASS HOURS	AFTER CLASS HOURS
IM0011	Applied Mechanics I	1.5	3	3
IM0020	Print Reading	2.0	4	2
IM0051	Trade Theory I	4.5	9	3
IM0061	Shop Practice I	5.5	11	1
IM0070	Technical Communications	1.5	3	2
	TOTAL	15	30	11

SEMESTER II

COURSE		CREDITS	IN CLASS HOURS	AFTER CLASS HOURS
IM0012	Applied Mechanics	1.5	3	3
IM0030	Computer Applications	3.0	6	1.5
IM0052	Trade Theory II	5.0	10.5	3
IM0062	Shop Practice II	4.5	9	1
	TOTAL	15	28.5	8.5
IM0040	Work Experience	1	40*	-

*150 hours of work experience (April)

COURSE DESCRIPTIONS

APPLIED MECHANICS I: IM0011

This course is designed to review basic mathematical operations. Students will receive instruction in mathematical applications as they pertain to Industrial Maintenance Technicians working in industry.

PRINT READING: IM0020

Students will be given instruction on the interpretation of engineering drawings. Concepts of orthographic and isometric projections, dimensioning, symbols, and multi-view drawings will be covered. The main focus of the course will be on the ability to interpret the information on prints.

TRADE THEORY I: IM0051

This course covers the terminology required by technicians in an industrialized setting. An introduction to safety, measurement, layout, benchwork, threads and fasteners, drilling, lathes, tapers, grinding, lubrication and coolants, power saws, metallurgy, alignment, rigging and hoisting, and the theory of operation of the equipment used in industry will be covered.

SHOP PRACTICE I: IM0061

The topics covered in Trade Theory I will be reinforced and applied in hands-on laboratory exercises. Students will be given the opportunity to gain proficiency in the use of equipment found in an industrial setting.

COMPUTER APPLICATIONS: IM0030

The Computer Applications course will examine the use of personal computers used in industry. Subjects covered will include an introduction of computer terminology, hardware, DOS and Windows. Students will be expected to develop competency in software application programs for word processing, spreadsheets and database. An introduction to the application of Programmable Logic Controllers (PLC) will also be included.

APPLIED MECHANICS II: IM0012

This course is a continuation of the topics covered in Applied Mechanics I with emphasis on the application of both mathematical and scientific principles related to industry. Students will examine the scientific principles of physics and chemistry as they relate to metals.

TECHNICAL COMMUNICATIONS: IM0070

This is a basic course designed to develop and strengthen the ability of students to express ideas and convey information in an oral and written format. Major topics will include report writing, grammar and sentence structure, verbal presentations, r§sum§ writing, and organization of information.

TRADE THEORY II: IM0052

This course is a continuation of the topics covered in Trade Theory I, as well as an introduction to the theory of bearings and lubrication; couplings; alignment and levelling; power transmissions; brakes and clutches; maintenance procedures planning; gas plant and shop compressors; gaskets, packing and seals; welding and fire safety; explosive actuated tools, and hydraulics.

SHOP PRACTICE II: IM0062

Students will be given an opportunity to reinforce and apply the theoretical knowledge acquired in Trade Theory II in a laboratory setting. Safety will be incorporated in all aspects of the labs.

WORK EXPERIENCE: IM0040

This course will allow the students to practice their skills from the classroom and laboratories in an industrial setting. The students will have the opportunity to acquire first-hand experience in an Industrial Maintenance Technician environment.

GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Industrial Maintenance Technician Program

COURSE SYLLABUS - SEMESTER I

APPLIED MECHANICS I: IM0011

This course is divided into ten units, the first six units will be offered in the first semester. Topics in mathematics and physics will be discussed from a practical perspective with examples from millwright and other related trades. This course is designed to provide students with a firm basis in mathematics and physics which will be applicable throughout their career.

Prerequisites: None
Textbooks: *Trade Mathematics for Machinists and Millwrights,* Northern Alberta Institute of Technology (NAIT)
Scientific Calculator
Class Hours: See Timetable

Review of Basic Mathematics

Prior to the commencement of this course, students will review the following basic mathematical concepts.

- fractions
- percentages
- triangles
- decimals
- formulae transposition
- ratio and proportion
- power roots and order of operations
- measurement (Imperial, metric, angular, taper)

Course Objectives

Unit 1: Linear Motion

Upon completion of this unit, students will be able to:

1. define basic terms used to describe linear motion including: speed, velocity, acceleration, average acceleration, distance, displacement, momentum, scalars, vectors, force, mass, acceleration due to gravity.

2. describe the law of conservation of motion and Newton's three fundamental laws of motion.

3. apply one of four general equations for uniformly accelerated motion to solve basic motion problems.

4. apply equations to solve introductory problems of momentum, force, mass and acceleration.

Unit 2: Force

Upon completion of this unit, students will be able to:

1. define terms related to force including: moment of force, torque, load, effort and mechanical advantage.

2. define the balancing of forces on a beam and be able to state the conditions for equilibrium of beam and lever systems.

3. solve basic problems related to the balancing of beams and levers, including mechanical advantage of a beam.

4. understand mechanical advantage/velocity ratio for: wheel and axle, pulleys, gears, block and tackle.

5. solve problems involving load, effort, mechanical advantage, radii and diameters for: block and tackle and wheel and axle systems.

6. solve problems related to the size and speed of gears and pulleys.

Unit 3: Friction

Upon completion of this unit, students will be able to:

1. define basic terms including: static friction, dynamic friction, coefficient of friction, force of friction and reaction at the normal.

2. solve basic orthogonal friction problems.

Unit 4: Pressure

Upon completion of this unit, students will be able to:

1. define basic terms including: static pressure, atmospheric pressure, gauge pressure, absolute pressure.

2. solve basic pressure problems for solids.

3. understand the relationship between absolute, gauge and atmospheric pressures in both Imperial and S.I. units.

Unit 5: Work and Power

Upon completion of this unit, students will be able to:

1. define the terms of work, power and efficiency.
2. be able to mathematically understand and derive the units for work.
3. understand efficiency in terms of output and input work or pressure.
4. solve basic work and power problems.
5. solve work and power problems for pumps.

Unit 6: Energy

Upon completion of this unit, students will be able to:

1. define terms including: energy, potential energy, kinetic energy.
2. be able to derive the units for energy.
3. describe the different forms of energy.
4. understand the relationship between thermal energy and mechanical energy.
5. understand the relationship between potential and kinetic energy.
6. describe the law of conservation of energy.
7. solve basic problems involving potential and kinetic energy.

Evaluation

The students will be evaluated as follows.

1. Assignments 20%
2. Midterm Exam 30%
3. Final Exam (theory) 30%
4. Quizzes 20%

Attendance

Refer to the Attendance Policy - Progression Criteria

GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Industrial Maintenance Technician Program

COURSE SYLLABUS - SEMESTER I

PRINT READING I: IM0020

This course is designed to provide instruction in the fundamentals of engineering drawing interpretation. Students will learn to sketch various objects with all relevant information. In addition, the orthographic and isometric projection of objects, scales, dimensioning, and symbolic representative will be studied.

Prerequisites: None
Textbooks: *Orthographic Projection Simplified*, Quinlan
Interpreting Engineering Drawings, Jensen and Hines
Class Hours: See timetable

Course Objectives

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

1. demonstrate the value of sketching objects.
2. describe the terms associated with interpreting engineering drawings.
3. draw the principle views of an object.
4. sketch the isometric projection of an object.
5. dimension an object.
6. demonstrate competency in interpreting the information found on engineering drawings
7. describe welding specifications and symbols.
8. label the auxiliary information required on drawings.

Evaluation

The students will be evaluated as follows.

1.	Assignments and Quizzes	25%
2.	Midterm Exam (1).....	20%
3.	Midterm Exam (2).....	20%
4.	Final Exam	35%

Attendance

Refer to the Attendance Policy - Progression Criteria

SEMESTER I

THEORY AND LAB HOURS

UNIT	THEORY HOURS	LAB HOURS
Safety and Introduction	4	
Measurement	10	
Layout	4	
Benchwork	10	
Threads and Fasteners	10	
Drilling	12	
Lathes	16	
Tapers	3	
Grinding	4	
Lubrication and Coolants	3	
Power Saws	4	
Metallurgy	10	
Alignment	12	6
Rigging and Hoisting	16	
Welding and Fire Safety	12	24
TOTAL	130	176*

*Lab hours are proportioned out in fabricating of shop projects
Some hours are proportioned out for planned tours to plant sites

GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Industrial Maintenance Technician Program

COURSE SYLLABUS - SEMESTER I

TRADE THEORY I: IM0051

This course will be presented in unit form. each unit will incorporate a set of objectives.

Prerequisites: None

Textbooks:
Technology of Machine Tools, Krar and Oswald
I.P.T.'s Industrial Fasteners Handbook
I.P.T.'s Industrial Trades Handbook, Basaraba
I.P.T.'s Crane and Rigging Handbook, Garby
I.P.T's Rotation Equipment Handbook
Manual of Instruction for the Millwright Trade BC Manual, BC
Millwright Manual Study Guide
Student's Shop Reference Handbook

Optional *Workbook for Technology of Machine Tools*, Krar and Oswald

Class Hours: See timetable

Course Objectives

Unit 1: Safety

Safety is everyone's business. This unit will stress the importance of work safety, taking into consideration the safety of all students.

Upon completion of this unit, students will be able to:

1. give reasons why safety is important.
2. recognize unsafe work habits.
3. correct unsafe work habits.
4. apply safe work practices in the lab.

Unit 2: Measurement

This unit will introduce students to the principles of accurate measurement using precession measurement instruments and gages.

Upon completion of this unit, students will be able to:

1. explain the concept of accuracy.
2. describe the measuring systems in use today.
3. measure angles to an accuracy of 1/12 of a degree.
4. understand limits and tolerances.
5. measure workpieces to an accuracy of ± .001" using the following instruments:
    - micrometers
    - telescopic gauges
    - ball gauges
    - dial gauges
    - vernier instruments.

Unit 3: Layout

This unit will demonstrate the process of marking an outline to indicate the shape of an object. These lines and reference points will show students where to machine.

Upon completion of this unit, students will be able to:

1. identify why layouts are needed.
2. identify common layout tools.
3. layout workpieces from drawings or specifications.

Unit 4: Benchwork

In this unit, students will acquire knowledge of effective selection of hand tools and their use.

Upon completion of this unit, students will be able to:

1. define the term benchwork.
2. explain the proper care of benchwork tools.
3. identify and select the proper hand tools required for the various operations of the maintenance industry.

Unit 5: Threads and Fasteners

This unit will introduce students to the purpose of thread forms and the calculations and terminology used.

Upon completion of this unit, students will be able to:

1. state the uses of the common fasteners.
2. identify thread parts, forms and series.
3. identify the most common mechanical fasteners used in the lab.

Unit 6: Drilling

Students will receive instruction on cutting tools and acquire knowledge to perform basic machine operations on drilling machines.

Upon completion of this unit, students will be able to:

1. explain safety rules that pertain to drilling operations.
2. effectively understand the following operations performed on the drill press:
    - drilling
    - counter boring
    - counter sinking
    - reaming
    - spot facing
    - trepanning
    - tapping.
3. identify types of drill presses.
4. identify drill bit terminology.
5. calculate speeds and feeds of a drilling machine and lathe for the various metals and operations.
6. recognize causes of drill failure.

Unit 7: Lathes

Application and functions of the lathe will be discussed. Basic operations, care and maintenance procedures that are performed on the lathe will be included.

Upon completion of this unit, students will be able to:

1. explain the basic functions of the lathe.

2. state the purpose of the main operative parts of the lathe.

3. be familiar with the necessary precautions required to run a lathe.

4. describe the various operations performed on lathes:

    - turning - roughing
      - finish
    - facing
    - grooving
    - parting off.

5. calculate proper speeds and feeds.

Unit 8: Tapers

Tapers have many uses in industry. Students will be taught the purposes of tapers and their applications.

Upon completion of this unit, students will be able to:

1. identify the different types of tapers.

2. identify the purpose of self-holding and self-releasing tapers.

3. measure and gauge tapers properly.

4. perform taper calculations.

5. describe tapers using the following methods:

    - tailstock offset
    - taper attachment
    - compound rest.

Unit 9: Grinding

The effective use of grinders and procedures will be discussed. Composition and the marking system of the grinding wheel will be included.

Upon completion of this unit, students will be able to:

1. define the term offhand and precision grinding.

2. identify types of grinding wheels and their purpose.

3. explain the purpose of abrasive grits.

4. explain the different types of abrasives

Unit 10: Lubrication and Coolants

Discussion of the theories in lubrication and cutting fluids will include characteristics, methods of application and terminology used.

Upon completion of this unit, students will be able to:

1. identify lubricants.
2. list the functions of cutting fluids and lubricants.
3. describe the basic types of cutting fluids.
4. describe the methods of lubrication.

Unit 11: Power Saws

The different types and applications of metal cut-off saws will be discussed. Bandsaw blade types and application will be included.

Upon completion of this unit, students will be able to:

1. effectively use the power hacksaw for the following operations:
    - stock cutting including multiple cutting
    - external cutting
    - friction sawing.

Unit 12: Metallurgy

The properties and heat treatment of metals will be explained. The manufacturing process and production of steels and their classifications will be included.

Upon completion of this unit, students will be able to:

1. describe the manufacturing of ferrous metals.
2. describe the SAE/AISI systems to classify steel.
3. describe the mechanical properties of metals.
4. perform basic hardening of small hand tools.

Unit 13: Alignment

Alignment is essential in order to ensure the long service life of rotating equipment and components. Improper alignment is one of the major causes of machine failure. Emphasis will be placed on basic alignment procedures and equipment.

Upon completion of this unit, students will be able to:

1. list reasons for safe lock-out and tag-out procedures pertaining to alignment.
2. identify alignment tools and equipment.
3. describe basic alignment methods and procedures.

Unit 14: Rigging and Hoisting

This unit will examine the operation of rigging and hoisting equipment and the principles of safe and effective rigging practices.

Upon completion of this unit, students will be able to:

1. identify the various rigging equipment.
2. describe rigging procedures and safety.
3. describe the types and uses of wire rope, fibre rope, and chain rope.
4. identify standard hand signals.
5. explain, crane and hoist maintenance and safety procedures.
6. describe the use of ladders and scaffolds.

Unit 15: Welding and Fitting

This unit will provide students with an understanding of welding principles. Subjects covered will be welding, brazing, flame cutting, and electric arc welding in the flat and horizontal and vertical position. Introduction to GMAW (MIG welding) procedures, and the application of pre and post heating and introduction to the piping industry will be included.

Upon completion of this unit, students will be able to:

1. describe the purpose of safety and protection devices.
2. describe the different classes of fires and the types of extinguishers used for each.
3. know good housekeeping procedures.

4. relate the safe use of oxyacetylene cylinders.

5. explain maintenance and cleaning principles of gas equipment.

6. explain basic electric principles of arc welding.

7. describe arc welding procedures.

8. identify different electrodes including storage and handling.

9. identify various types of pipe fittings

Evaluation

The students will be evaluated as follows.

1.	Assignments	10%
2	Quizzes	15%
3.	Midterm Exam (1)	20%
4.	Midterm Exam (2)	20%
5.	Final Exam	35%

Attendance

Refer to the Attendance Policy - Progression Criteria

SHOP PRACTICE I: IM0061

This course is designed to give students a hands-on approach to learning. Layout and fabricating projects will improve students' critical thinking skills.

Prerequisites: None
Textbook: See Trade Theory I Syllabus
Class Hours: See Timetable

Course Objectives

Unit 1: Safety

Students will implement safety regulations and precautions for each other, tools and machines.

Upon completion of this unit, students will be able to:

1. demonstrate safe shop practices.
2. demonstrate effective housekeeping practices.

Unit 2: Measurement

Students will use both the standard and the metric system of measurement in processing shop projects. Measurement will include the application of precision and non-precision measurement.

Upon completion of this unit, students will be able to:

1. perform precision shop measurement.
2. use the various types of gages.
3. apply principle of limits of size and fit in manufacture of projects.
4. care for measurement tools properly.

Unit 3: Layout

Following a blueprint, the student will transfer the information to his/her project. Accuracy of the layout will be stressed as the lines made will be the guide.

Upon completion of this unit, students will be able to:

1. demonstrate the proper and safe use of non-precision and semi-precision layout tools.
2. construct basic layouts.

Unit 4: Benchwork

Benchwork will include the operations of laying out, fitting and assembling shop projects.

Upon completion of this unit, students will be able to:

1. select the proper hand tool for the job.
2. demonstrate required shop procedures for effective use and handling.
3. provide the proper care and storage of tools.

Unit 5: Thread and Fasteners

This unit will consist of machining internal and external threads on shop projects.

Upon completion of this unit, students will be able to:

1. demonstrate effective use of tap and dies.
2. demonstrate procedures for set-up and producing a thread on the lathe.

Unit 6: Drilling

The students will be required to use effective work set-up, speed calculations and safe procedures in manufacturing of shop projects.

Upon completion of this unit, students will be able to

1. make safe set-ups.
2. sharpen a twist drill.

3. work safely with drills and drilling machines.

Unit 7: Lathes

Students will acquire the basic knowledge and safety skills to perform proper lathe handling and operational procedures.

Upon completion of this unit, students will be able to:

1. perform various operations performed on lathes:
    - boring and counter boring
    - taper turning
    - form and profile turning
    - threading
    - filing and deburring
    - polishing
    - drilling
    - centre drilling
    - reaming
    - knurling
    - turning between centres.
2. set-up the various lathe accessories.
3. use the various lathe accessories.
4. effectively grind lathe turning tools.

Unit 8: Tapers

Students will demonstrate the various taper methods and set-up procedures in the machining of shop projects.

Upon completion of this unit, students will be able to:

1. produce tapers using the following methods:
    - tailstock offset
    - taper attachment
    - compound rest.
2. cut short and steep tapers using the compound rest.

Unit 9: Grinding

This unit will introduce the students to safe and effective grinding procedures.

Upon completion of this unit, students will be able to:

1. demonstrate the correct and safe use of grinders.
2. display effective dressing and truing procedures.
3. demonstrate safe wheel handling and mounting procedures.
4. select the proper wheel for the job being done.

Unit 10: Lubrication and Coolants

Students will be taught the importance of lubricants and cutting fluids and effective applications.

Upon completion of this unit, students will be able to:

1. perform maintenance operations on shop machinery.
2. mix coolants for shop machinery.
3. use cutting fluids safely.

Unit 11: Power Saws

Students will be taught the correct and safe use of bandsaws while performing stock cut-off of material used in projects.

Upon completion of this unit, students will be able to:

1. work safely with sawing machines and attachments.
2. mount a blade on machine.
3. prepare the blade for machine use.
4. position work to cut efficiently.

Unit 12: Metallurgy

Students will learn safe and effective work habits in heat treating a shop project.

Upon completion of this unit, students will be able to:

1. demonstrate procedure for heat treating.
2. display safe and effective handling of oxyacetylene equipment.

Unit 13: Alignment

Students will learn basic alignment techniques in the process of setting up and aligning shop projects.

Upon completion of this unit, students will be able to:

1. demonstrate basic alignment.
2. demonstrate the effective use of alignment equipment.

Unit 14: Rigging and Hoisting

In this unit students will examine lifting machinery components using rigging and hoisting methods.

Upon completion of this unit, students will be able to:

1. demonstrate safe and effective rigging procedures.
2. describe the use of rigging knots.
3. identify hand signals.
4. determine the centre of gravity.

Unit 15: Welding and Fitting

Shop work will give the student an opportunity to use an oxygen/acetylene torch in a safe and reliable manner to perform tasks associated with cutting and brazing. In addition students will perform various weld joints using an arc welder.

Upon completion of this unit, students will be able to:

1. demonstrate the proper handling of oxyacetylene equipment.

2. perform gas welding and cutting procedures,

3. perform arc welding set-up procedures.

4 perform arc welding of various weld joints.

5. perform pipe fitting and layout.

Evaluation

The students will be evaluated on shop projects, as follows.

1.	Punch and Chisel Set	30%
2.	Shaft	10%
3.	Cannon	30%
4.	Drill Sharpening	5%
5.	Alignment	10%
6.	Rigging and Hoisting (procedures)	5%
7.	Welding and Fitting	10%

Attendance

Refer to the Attendance Policy - Progression Criteria

GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Industrial Maintenance Technician Program

COURSE SYLLABUS - SEMESTER I

TECHNICAL COMMUNICATIONS: IM0070

This course will provide students with the opportunity to refresh their oral and written communication skills. Instruction will focus on reading, writing, speaking, listening, and critical thinking. Assignments will integrate communication skills as they relate to both study and career needs. The emphasis will be on patterns of organising information (written or spoken) on basic writing strategies and format. Short technical reports and informative presentations will be included.

Prerequisites: None
Textbooks: TBA, and Handouts
Class Hours: See Timetable

Course Objectives

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

1. apply the correct use of grammar, spelling, and punctuation to report writing.
2. demonstrate effective reading skills in the interpretation of the charts, manuals and documentation associated with industrial equipment.
3. understand the importance of careful preparation and planning in all forms of employment communication and documentation.
4. develop effective reading habits, study and note taking skills.
5. deliver an effective oral presentation on a preselected topic.

Evaluation

1. Assignments/Quizzes 20%
2. Presentation..... 20%
3. Term Paper 30%
4. Final Exam 30%

Attendance Refer to the Attendance Policy - Progression Criteria

APPLIED MECHANICS II: IM0012

A continuation of the topics in mathematics and physics discussed in Applied Mechanics I.

Prerequisites: IM0011
Textbook: TBA
Class Hours: See Timetable

Course Objectives

Unit 7: Fluid Principles

Upon completion of this unit, students will be able to:

1. define terms related to fluids including: atom, molecule, element, density, relative density, specific volume, laminar flow, turbulent flow, viscosity, and flash point.
2. describe the properties of fluids including: molecular attraction of fluids and solids, cohesion, adhesion, capillary action, buoyancy, the effects of resistance and turbulence on flow, compressibility and expendability of fluids.
3. describe Pascal's Law.
4. describe Archimedes principle.
5. describe the continuity equation.
6. describe Bernoulli's equation.
7. solve problems involving mass, weight, volume and density for liquids and solids.
8. solve problems involving Pascal's Law and calculations of pressure head of fluids.
9. solve problems involving Archimedes principle, the force of buoyancy and objects submerged in fluids.
10. solve problems involving the continuity equation and venturi meters.
11. solve problems involving Bernoulli's equation and the linear velocity of fluids.

Unit 8: Thermodynamics

Upon completion of this unit, students will be able to:

1. define temperature, heat, specific heat, sensible heat, latent heat, saturation temperature and superheat.
2. describe the principle of linear, surface and volumetric expansion of solids and liquids.
3. describe the kinetic molecular theory of heat and the importance to phase changes.
4. describe the relationship between the four temperature scales: Fahrenheit, Celsius, Rankine and Kelvin.
5. describe methods of heat transfer: conduction, convection and radiation.
6. perform calculations for heat gain/loss of a liquid including simple steam table questions.
7. perform calculations for heat gain/loss for mixtures.
8. perform calculations for the expansion of solids.

Unit 9: Perfect Gases

Upon completion of this unit, students will be able to:

1. define Boyle's Law, Charles' Law, Gay Lussac's Law and the general gas law for perfect gases.
2. discuss compressibility and expendability of gases.
3. perform basic pressure, volume, temperature calculations.

Unit 10: Solids

Upon completion of this unit, students will be able to:

1. define concepts related to solids including: stress, strain, elasticity, factor of safety, Hooke's Law, elastic limit, yield point, ultimate strength, working stress and Young's modulus.
2. discuss compressive, tensile and shear forces.
3. perform calculations for stress, strain, factor of safety and elasticity.

Evaluation

The students will be evaluated as follows.

1.	Assignments	20%
2.	Midterm Exam	30%
3.	Final Exam (theory)	30%
4.	Quizzes	20%

Attendance

Refer to the Attendance Policy - Progression Criteria

GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Industrial Maintenance Technician Program

COURSE SYLLABUS - SEMESTER II

COMPUTER APPLICATIONS: IM0030

This course is designed to allow students to gain an appreciation of computer fundamentals as it applies in an industrial setting. Students will be exposed to the terminology and concepts of a computer. Labs will cover practical applications in Windows and DOS, word processing, spreadsheets, database, and programmable logic control systems.

Prerequisites: None
Textbook: TBA
Class Hours: See Timetable

Course Objectives

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

1. know the basic terminology of computers.
2. understand how computers can be used in an industrial setting.
3. demonstrate fundamental skills on specific software applications.
4. understand the operating principle of a Programmable Logic Controller
5. understand the principle behind the hardware components associated with a personal computer.
6. appreciate personal computer future trends.

Evaluation

The students will be evaluated as follows.

1. Lab Assignments 40%
2. Midterm Exam 10%
3. Final Exam (theory) 20%
4. Final Exam (lab) 20%
5. Term Paper (approved topic) 10%

Attendance Refer to the Attendance Policy - Progression Criteria

SEMESTER II

THEORY AND LAB HOURS

UNIT	THEORY HOURS	LAB HOURS
Bearings and Seals	24	14
Lubrication	8	2
Gaskets	6	3
Couplings, Clutches, and Brakes	18	8
Alignment and Levelling	9	9
Power Transmissions	20	12
Gears and Speed Changer	12	5
Reciprocating Comptessors	26	20
Hydraulics	13.5	23
TOTAL	136.5	96

Some hours will be allotted for outside work (shop) ie. Hydraulics.

Catalogue & manual data homework assignment.

GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Industrial Maintenance Technician Program

COURSE SYLLABUS - SEMESTER II

TRADE THEORY II: IM0052

This course is designed to give students an understanding of mechanical principles and concepts.

Prerequisites: IM0051
Textbooks: See Trade Theory I Syllabus
Class Hours: See Timetable

Course Objectives

Bearings and Seals

This unit studies the use of bearings in machines. The students will be able to classify the types of bearings and how they are installed and used. Students will examine lubricants and lubricating systems and will determine causes of failure of those systems.

Upon completion of this unit, students will be able to:

1. identify the types and purposes of bearings.
2. describe procedures for fitting and installing bearings.
3. identify causes of bearing failure.
4. identify corrective procedures.
5. list bearing preventative maintenance procedures.
6. identify lubricants.
7. explain characteristics of friction.
8. describe the types of oil applications and their advantages and disadvantages.
9. describe the types of grease and their advantages and disadvantages.

Lubrication

This unit will provide knowledge in the types and applications of various lubricants.

Upon completion of this unit, students will be able to:

1. explain the characteristics of friction.
2. discuss the lubrication theory and the importance of lubricants.
3. describe different lubrications and application methods.

Couplings

This unit will centre on the application and method of connecting two rotating shafts and various types of couplings. Proper alignment will also be studied.

Upon completion of this unit, students will be able to:

1. identify the different types of couplings.
2. list safety rules for installing, removal and maintenance of couplings.
3. describe the applications of different couplings.

Brakes and Clutches

This unit will introduce the student to the applications and functions of brakes and clutches.

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

1. describe the function of brakes and clutches.
2. list the materials in brakes and clutches.
3. identify the types of positive drive clutches.
4. identify the types of friction clutches.
5. describe the types of brakes.
6. describe the methods of applying brakes.

Alignment

In this unit the students will understand the procedures used for double dial indicator alignment.

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

1. identify the safety rules.
2. describe the types of alignment.
3. identify the types of cross dialing.
4. illustrate the graph method of alignment.
5. describe end float and thermal growth.

Power Transmissions

In this unit, students will examine the transmission of power through shafts and belts, and the types of transmission belts, belt pulleys and methods of attachment.

Upon completion of this unit, students will be able to:

1. know the safety methods pertaining to power transmissions.
2. describe shafting and characteristics.
3. identify key fit and applications.
4. describe the types of belts.
5. describe the types of pulleys.
6. describe maintenance procedures.
7. know the transmission chain features, applications, installations and maintenance concerns.
8. identify sprockets.

Gears and Speed Changers

In this unit the students will examine gears and speed changers and the application of:

1. identify the types of gears and terminology.
2. List the various gear systems and characteristics.

3. Describe the types of drives.

4. Identify and describe the types of speed changers.

5. List the purpose, applications, advantages and disadvantages of units.

Reciprocating Compressors

This unit will introduce the student to the different types of compressors as well as general operation and maintenance procedures.

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

1. list safety precautions and regulations.
2. list the types of compressor classifications.
3. explain positive displacement compressors, parts and components.
4. describe dynamic compressors.
5. explain the general operations of compressors.
6. identify reciprocating, rotary and dynamic compressor parts and terms.
7. Describe general compressor operating procedures and criteria.
8. list and describe procedures for dismantling, inspection, repair and installation.
9. identify preventative maintenance procedures.

Gaskets

This unit will provide knowledge in the types and application of gaskets, packing and seals.

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

1. know the safety rules and precautions pertaining to removal and installation.
2. identify the types and applications of various gaskets and gasket material.

Hydraulics

Hydraulics will cover the use of fluids (liquids, gases) and the force created or transmitted by fluids. Emphasis will be placed on basic hydraulic principles and fundamentals including Pascal's Law and Bernoulli's Principle. Basic hydraulic circuits, components, and their operations will be examined.

Upon completion of this unit, students will be able to:

1. explain Pascal's Law and hydraulic principle, conservation of energy, Bernoulli's Principle.
2. explain the application of constant and variable volume systems as applied to machines.
3. describe components of a hydraulic system.
4. calculate the various valves in hydraulic systems.
5. sketch hydraulic schematics.
6. identify the theory of hydraulic pumps and motors.
7. explain maintenance and troubleshooting procedures.

Evaluation

The students will be evaluated as follows.

1. Assignments 10%
2. Quizzes 15%
3. Midterm Exam (1) 20%
4. Midterm Exam (2) 20%
5. Final Exam 35%

Attendance

Refer to the Attendance Policy - Progression Criteria

GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Industrial Maintenance Technician Program

COURSE SYLLABUS - SEMESTER II

SHOP PRACTICE II: IM0061

The shop practice course is designed to provide the students with practical experience in applying trade-related skills. Emphasis will be placed on the hands-on approach to allow students to perform actual maintenance procedures. Wherever possible actual industrial equipment will be assessed and repaired.

Prerequisites: IM0061
Textbooks: See Trade Theory I Syllabus
Class Hours: See Timetable

Course Objectives

Bearings and Lubrication

Shop work will include an effective working knowledge and use of bearings.

Upon completion of this unit, students will be able to:

1. effectively demonstrate mounting and dismounting procedures.
2. perform mounting and dismounting procedures.
3. demonstrate bearing component assembly and disassembly.
4. perform applications of lubrication to machinery and bearings.

Lubrication

Shopwork will include the correct selection and application of lubricants as required.

Upon completion of this unit students will be able to;

1. demonstrate the types of lubricant applicators.
2. describe the amount and types of lubricants for specific applications.

Couplings

Shop work will include the installation and alignment of various couplings in a related shop project.

Upon completion of this unit, students will be able to:

1. demonstrate coupling mounting and dismounting procedures.
2. explain coupling alignment procedures.

Brakes and Clutches

In this unit the student will examine clutch and brake operating mechanisms an identify applicable maintenance procedures.

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

1. demonstrate clutch mounting and dismounting procedures.
2. explain clutch maintenance and alignment.
3. illustrate methods of brake applications.
4. display brake installation and maintenance procedures.

Alignment

This unit will demonstrate the process for cross dialing alignment procedures.

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

1. perform a cross dialing procedure, using graph methods.

Power Transmissions

Shop work will give experience in the installation, alignment, and assembly of a specified shop project. It will include assembling a chain and belt drive unit. Emphasis will be placed on gear backlash, end float and lubrication.

Upon completion of this unit, students will be able to:

1. demonstrate chain and sprocket mounting and alignment procedures.
2. demonstrate belt and chain tensioning.
3. describe gear backlash.

Gears and Speed Changers

In this unit students will work with gear, splines, gear boxes and speed changers.

Upon completion of this unit, students will be able to:

1. demonstrate and perform gear and speed changer maintenance and overhaul procedures.
2. demonstrate ability to check and set gear mesh, gear backlash and bearing settings.
3. demonstrate and perform gear box assembly, disassembly and servicing techniques.

Reciprocating Compressors

Shop work will look at compressor preventative maintenance techniques including safety blocking and purging. It will look at applications of compressor components

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

1. practise safety rules
2. explain applications of compressor components.
3. demonstrate and perform unloading procedures.
4. demonstrate compressor safety blocking and purging procedures.
5. demonstrate and perform dismantling and installation of compressor components.
6. apply compressor preventative maintenance techniques.

Gaskets

This unit will look at installation criteria of gaskets, packing and seals.

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

1. practise safety procedures.
2. demonstrate installation procedures for packing and seals.

Hydraulics

This unit will teach students the components of hydraulic systems. Students will increase their working knowledge of hydraulic circuits and schematics.

Upon completion of this unit, students will be able to:

1. demonstrate safe shop working procedures including personal safety equipment usage.
2. perform safe shop working procedures including personal safety equipment usage.
3. identify the basic hydraulic components.

Evaluation

The students will be evaluated on shop projects, as follows.

1.	Bearing and Bushing (installation, removal)	10%
2.	Coupling Installation	5%
3.	Alignment of Couplings (graph)	15%
4.	Power Transmission (set-up)	25%
	a. safety lock	
	b. belts	
	c. chains	
	d. clutches	
	e. maintenance and planning procedures	
	f. setup, organization and planning	
5.	Compressors	10%
	a. single acting	
	b. double acting	
6.	Gaskets, Packing and Seals	5%
7.	Hydraulic Component (set-up)	15%
8.	Work Habits and Ethics	10%
9.	Catalogue Manual Data	5 %
	Total	100%

Attendance

Refer to the Attendance Policy - Progression Criteria

GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Industrial Maintenance Technician Program

COURSE SYLLABUS - SEMESTER III

WORK EXPERIENCE: IM0040

This course will give students an opportunity to experience a hands-on approach to actual procedures in the maintenance trade.

Prerequisites: IM0011, IM0020, IM0030, 1M0051, 1M0061
Textbooks: None
Class Hours: Workplace Hours (150 hours total)

Course Objectives

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

1. experience a hands-on approach to being an Industrial Maintenance Technician and Millwright.
2. understand employer expectations in regards to punctuality, work expected, and work ethic.

Evaluation

1. The employer of the work experience placement, in addition to the instructor will evaluate students.

Attendance

Refer to the Attendance Policy - Progression Criteria