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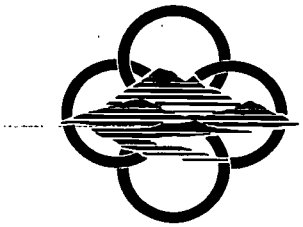
ABSTRACT

This student manual explains an innovative strategy through which Bellingham Technical College's (Washington) evening Industrial Electrician and Millwright Apprenticeships were aggregated with workforce upgrade course offerings to form the college's first evening degree program in Industrial Maintenance Technology (IM-TEC). Section 1 contains a program description, list of program objectives, and graduation requirements. Section 2 provides the IM-TEC curriculum, listing required courses and elective curriculum options. Section 3 consists of course descriptions. Section 4 specifies course sequences, including prerequisites, sequential courses, and independent (without prerequisites) courses. Section 5 provides a typical student schedule of courses that covers 15 quarters. The manual also contains a blank student planning sheet for scheduling classes and a book list of 47 required and recommended textbooks. (YLB)



BELLINGHAM
TECHNICAL
COLLEGE

INDUSTRIAL MAINTENANCE TECHNOLOGY (IM-TEC)

STUDENT MANUAL

by

Gene E. Fusch

BELLINGHAM TECHNICAL COLLEGE IS COMMITTED TO THE PRINCIPLES OF AFFIRMATIVE ACTION AND IS AN EQUAL OPPORTUNITY EMPLOYER

Introduction

With new governance in 1991, Bellingham Technical College underwent a change from an adult vocational technical institute (VTI) governed by the local K-12 school district to the newly created Washington State Board for Community and Technical Colleges. Still in place from the VTI era, the college preparatory programs predominantly provided embedded instruction taught by one or two instructors that culminated in an Associate in Applied Science Degree after two years and a minimum of 1800 clock hours of instruction. Students attended their programs for six hours a day, thirty hours per week. All of Bellingham Technical College's AAS degree program offerings were during the day with only a couple short certificate offerings in the evening.

With a lack of opportunities for students working during the day, it was clear that any systemic approach was needed to provide access for students unable to attend the archetypal VTI day preparatory programs. This student manual explicates an innovative strategy that aggregated Bellingham Technical College's evening Industrial Electrician and Millwright Apprenticeships with workforce upgrade course offerings to offer the college's first evening degree program in Industrial Maintenance Technology (IM-TEC).

BELLINGHAM TECHNICAL COLLEGE

INDUSTRIAL MAINTENANCE TECHNOLOGY (IM-TEC)

Introduction:

All facilities including manufacturing, distribution, education, or municipality require maintenance technicians to keep the facilities in operation. An advisory committee of eight leading Whatcom County employers and the Training Coordinator from the Western Washington Stationary Engineers Joint Apprenticeship and Training Committee, identified a need for well trained maintenance technicians in Whatcom County. This program prepares maintenance technicians currently employed, and individuals desiring careers as industrial maintenance technicians.

Program Description:

This Associate in Applied Science Degree Program in Industrial Maintenance Technology (IM-TEC) evening prepares students with the knowledge and skills required for success as an industrial maintenance technician (often referred to as: industrial electricians, millwrights, or stationary engineers). Utilizing a dynamic six hour industry analysis course each quarter, students develop their career decisions and goals. Students will enroll for a minimum of 120 clock hours of program course-work per quarter. Through a combination of classroom theory and practical application, students develop a strong industrial maintenance foundation in the program core. Elective courses offer students opportunity to specialize toward their individual goals.

Program Objectives:

1. Provide students with industrial maintenance competencies required by the industry. Student competencies include electrical troubleshooting, hydraulic and fluid power, welding, industrial mechanical systems, pipefitting, HVAC/R, total quality management, work ethics, and safety.

2. Provide training in a work-like environment that appropriately integrates theory and lab experiences to teach skills, work habits, attitudes, safety, environmental awareness, and critical thinking to be successful on the job.

3. Teach related instruction in communication, mathematics, human relations, and leadership.

4. Provide students an opportunity to prepare for gainful employment part time during the evening.

Graduation Requirements:

Students may apply for an Associate in Applied Science Degree upon completion and verification of the program requirements and standards. Students must complete:

1) Enrollment in the program and completion of the College Placement Test (CPT).

2) Required coursework with a minimum of a 2.0 grade point average.

3) Elective coursework with a minimum of a 2.0 grade point average.

   a. This may include an approved workplace component (co-op).

4) Related courses in Occupational Math, Oral and Written Communications, and Human Relations with a minimum of a 2.0 grade point average.

BELLINGHAM TECHNICAL COLLEGE

INDUSTRIAL MAINTENANCE TECHNOLOGY (IM-TEC)

CURRICULUM

REQUIRED COURSES

IMTEC 901	INDUSTRY ANALYSIS	(6 hrs. per quarter)	72 hrs.
MATH 100	OCCUPATIONAL MATH		54 hrs.
COM 170	ORAL & WRITTEN COMMUNICATIONS		54 hrs.
HR 180	HUMAN RELATIONS		54 hrs.
IMTEC 903	INTRODUCTION TO ELECTRICITY		30 hrs.
IMTEC 905	ELECTRICAL CIRCUITS I		30 hrs.
IMTEC 907	ELECTRICAL CIRCUITS II		30 hrs.
IMTEC 909	ELECTRICAL CIRCUITS III		30 hrs.
IMTEC 911	ELECTRICAL CONTROLS & SWITCHES		30 hrs.
IMTEC 913	ELECTRICAL TROUBLESHOOTING		30 hrs.
IMTEC 915	DC MTRS & GENERATORS		30 hrs.
IMTEC 917	AC MTRS		30 hrs.
IMTEC 919	CIRCUIT PROTECTOR DEVICES		30 hrs.
IMTEC 921	PUMPS & FLOW SYSTEMS		30 hrs.
IMTEC 923	PROGRAM LOGIC CONTROLLERS		30 hrs.
IMTEC 925	INSTRUMENTATION		30 hrs.
IMTEC 927	SOLID STATE CONTROLS I		30 hrs.
IMTEC 929	SOLID STATE CONTROLS II		30 hrs.
IMTEC 931	ELECTRIC PROCESS HEATING		30 hrs.
IMTEC 933	TRANSFORMERS & RECTIFIERS		30 hrs.
IMTEC 941	TRADE SCIENCE I		30 hrs.
IMTEC 943	TRADE SCIENCE II		30 hrs.
IMTEC 945	INTRO TO MACHINERY SKILLS		30 hrs.
IMTEC 947	MAINTENANCE ECONOMICS		30 hrs.
IMTEC 951	HYDRAULICS & PNEUMATICS I		30 hrs.

IMTEC 953	HYDRAULICS & PNEUMATICS II	30 hrs.
IMTEC 955	HYDRAULICS & PNEUMATICS III	30 hrs.
IMTEC 957	BLUE PRINT READING	30 hrs.
IMTEC 959	METALLURGY FOR THE NON-METALLURGIST	30 hrs.
WELD 901	WELDING I	30 hrs.
WELD 921	WELDING II	30 hrs.
WELD 931	WELDING III	30 hrs.
IMTEC 961	PIPEFITTING I	30 hrs.
IMTEC 963	PIPEFITTING II	30 hrs.
IMTEC 965	RIGGING	30 hrs.
IMTEC 967	BEARINGS/PACKING & SEALS	30 hrs.
IMTEC 969	ALIGNMENT & BALANCING	30 hrs.
IMTEC 971	CONVEYOR & DRIVE SYSTEMS	30 hrs.
IMTEC 973	COMBUSTION TECHNOLOGY	30 hrs.
IMTEC 981	BOILERS I	30 hrs.
IMTEC 983	REFRIGERATION THEORY I	30 hrs.
IMTEC 985	REFRIGERATION THEORY II	30 hrs.
IMTEC 987	AIR HANDLING SYSTEMS	30 hrs.
IMTEC 991	TQM	30 hrs.
IMTEC 993	INTRO TO COMPUTERS	30 hrs.
IMTEC 995	SAFETY & HYGIENE	30 hrs.
IMTEC 997	INDUSTRIAL SAFETY II	30 hrs.
	TOTAL HOURS	1524

TOTAL ELECTIVE CURRICULUM OF 276 HOURS
FROM THE FOLLOWING OPTIONS:

GENERAL ELECTRIC DISTRIBUTION
NATIONAL ELECTRICAL CODE
BOILERS II
PNEUMATIC CONTROLS
IND. FIRST AID/CPR
COMPUTER COURSES
APPLICABLE CE COURSES
WORK BASED COMPONENT (CO-OP)

MATH 100 Occupational Math -- 54 hours
This course includes a review of application of basic math concepts and operation for the specific occupational programs, use of electronic calculator, reading and development of charts and graphs, simple algebraic expressions and geometry. This course meets the related math requirement for selected 1-2 year occupational certificate and degree programs. Text required.

COM-170 Oral & Written Communications -- 54 hours
This course focuses on workplace communication skills. Content includes writing fundamentals, applications to occupational areas, speaking, technical reading and writing, and teamwork skills. The course meets requirements for the communication component in 1 and 2 year occupational certificate programs at BTC.

HR-180 Human Relations -- 54 hours
Course designed to assist students in developing interpersonal skills necessary for the workplace. Human relations content includes customer relations, teamwork, leadership, problem solving, equity and diversity issues and personal development, course meets requirements for 1 and 2 year occupational certificate/degree program completion.

IM-TEC 901 Industry Analysis -- 6 hours per quarter (72 hours required)
Are you planing a career as an industrial electrician, millwright, stationary engineer? This course examines the industrial maintenance industry. Analyzing the opportunities, students develop knowledge and skills to plan their training and career goals. This course may be repeated for clock hour credit. This is a six hour course mandatory for the Associate of Applied Science Degree Program in Industrial Maintenance Technology (IM-TEC).

IM-TEC 903 Introduction to Electricity -- 30 hours
This is the first course in a series designed to prepare the industrial electrician, millwright, stationary engineer, and maintenance technician with knowledge and skills to diagnose and repair electrical circuits. Instruction emphasizes DC electrical theory through structure of matter, atomic theory electrical charges, electron theory, how electricity is produced, electric current, effects of electricity, electromagnetism, resistance, and Ohm's Law. Text required.

IM-TEC 905 Electrical Circuits I -- 30 hours
This course prepares students with electrical fundamentals. Instruction emphasizes series and parallel circuits. Utilizing Kirchhoff's Laws, students will develop knowledge and skills to calculate power, current, voltage, and resistance. Text required. Prerequisite IM-TEC 903

IM-TEC 907 Electrical Circuits II -- 30 hours
This course emphasizes AC and DC wave forms, frequency, and capacitive reactance. Students calculate power factors and capacitive loads in both series and parallel circuits. Text required. Prerequisite IM-TEC 905

IM-TEC 909 Electrical Circuits III -- 30 hours
This course covers effects of phase angles, frequency, vectors, current, impedance, capacitance, and power. Students develop diagnostic knowledge and skills through calculations and analysis of electrical circuits. Text required. Prerequisite IM-TEC 907

IM-TEC 911 Electrical Controls and Switches -- 30 hours
This course covers electrical schematics, controls, and switches utilized by the industrial maintenance industry. Students are introduced to the ammeter, voltmeter, ohmmeter, wattmeter, multimeter, and direct digital meter. Text required. Prerequisite IM-TEC 909

IM-TEC 913 Electrical Troubleshooting -- 30 hours
This course prepares students with skills and knowledge to troubleshoot electrical circuits. Through classroom theory and hands-on application, students utilize electrical schematics and direct digital meters to diagnose electrical failures. Text and direct digital meter required. Prerequisite IM-TEC 911

IM-TEC 915 DC Motors & Generators -- 30 hours
This course covers a variety of DC motors, shunt, compound, and series motors. Included are conventional DC motor controls, speed, torque, efficiency, and some applications. This course is applicable for electricians, millwrights, and persons desiring a general knowledge of DC motors. Text required. Prerequisite IM-TEC 913

IM-TEC 917 AC Motors -- 30 hours
This class covers the concepts of AC current, power and magnetism as applied to AC motors. Students develop knowledge and skills in theory and construction of induction and squirrel cage motors. Instruction includes making connections, maintenance, and troubleshooting. Text required. Prerequisite IM-TEC 915

IM-TEC 919 Circuit Protector Devices -- 30 hours
This course develops the industrial electrician and maintenance technician's knowledge of electrical protective devices and application. Instructional emphasis develops student's knowledge and skills to trouble-shoot and repair circuits with protection devices such as switches, fuses, circuit breakers, overload relays and the national electrical code grounding. Prerequisite IM-TEC 917

IM-TEC 921 Pumps and Flow Systems -- 30 hours
This course covers the theory of displacement and constant/variable delivery pumps. It will compare types of pumps for specific uses as well as related energy, heat at the pump. Some general operation trouble shooting is included as well as the motor power source. Text required.

IM-TEC 923 Programmable Logic Controllers -- 30 hours
This course prepares electricians and instrumentation technicians with the theory and operations of programmable logic controllers. Students develop knowledge and skill for maintenance and programming through classroom theory and hands-on practice. Prerequisite IM-TEC 913 Text required.

IM-TEC 925 Instrumentation -- 30 hours
The course covers the theory and use of basic instruments used in testing of solid state devices and the theory of instrument controlled processes. Prerequisite IM-TEC 913 Text required.

IM-TEC 927 Solid State Controls I -- 30 hours
An introduction to solid state controls for the industrial maintenance technician. Through classroom theory and hands-on practice students develop basic knowledge and skills in solid state controls and circuits. Text and supplies required after the first night of class. Prerequisite IM-TEC 913

IM-TEC 929 Solid State Controls II -- 30 hours
Building on Solid State Controls I, this course offers an overview of solid state devices for the electrician. Solid state electronic devices covered include transistors, diodes, logic amplifiers, transistors and fiber-optics. Text and supplies required after the first night of class. Prerequisite IM-TEC 927

IM-TEC 931 Electric Process Heating -- 30 hours
This course covers the principles of several types of electrical process heating including: resistance, impedance, induction, skin effect, and dielectric. Also covered are several magnetic devices including saturable reactor, magnetic amplifier, and amplidyne Prerequisite IM-TEC 913

IM-TEC 933 Transformers & Rectifiers -- 30 hours
The class covers the theory, construction and maintenance of transformers and rectifiers. Special transformers and connections (Wye & Delta) will be studied. Instruction introduces the ASA standard marking system and differences between three phase and single phase transformers. Text required. Prerequisite IM-TEC 913

IM-TEC 941 Trade Science I -- 30 hours
This course introduces material strengths relating to forces such as tension, shear and torque. Students develop knowledge and skills through application of levers and pulley ratios. Instruction also covers properties of materials such as solids, liquids, and gasses. Text required.

IM-TEC 943 Trade Science II -- 30 hours
This course covers pressure and gas laws including Boyle's Law and Charles' Law, torque and horse power definitions and calculations. Student will learn calculations to determine power and speed for various pulley ratios. Use of heat/cold to fit bearings and sprockets on a shaft will be covered. Text required. Prerequisite IM-TEC 941

IM-TEC 945 Introduction to Machinery Skills -- 30 hours
Instruction in basic to advanced machine tool skills using individualized practical experience and related skills necessary to satisfy the requirements of industry. Text optional.

IM-TEC 947 Maintenance Economics -- 30 hours
This course prepares the maintenance technician with knowledge and skills in cost and life cycle benefits and cost analysis. Instruction emphasizes budgeting job cost and preparing estimates and proposals. Students compare and contrast preventative maintenance (PM) and predictive maintenance to develop a maintenance philosophy with a proactive approach. In addition, this course offers an overview of ISO 9000 as related to the industrial maintenance technician.

IM-TEC 951 Hydraulics & Pneumatics I -- 30 hours
This course covers principles and operating characteristics of hydraulic and pneumatic systems and components. Instruction includes system maintenance and troubleshooting. Text Required.

IM-TEC 953 Hydraulics & Pneumatics II -- 30 hours
This course builds on Hydraulics & Pneumatics I to cover principles and operating characteristics of hydraulic and pneumatic systems and components. Instruction includes system maintenance and troubleshooting. Text Required. Prerequisite: IM-TEC 951.

IM-TEC 955 Hydraulics & Pneumatics III -- 30 hours
This course builds on Hydraulics & Pneumatics II to cover principles and operating characteristics of hydraulic and pneumatic systems and components. Instruction includes system maintenance and troubleshooting. Text Required. Prerequisite: IM-TEC 953.

IM-TEC 957 Blue Print Reading -- 30 hours
This unit covers the concepts of detail and assembly drawings. Students develop knowledge and skills with drawing revisions, tolerances, and concept of schematics. Some sketching will be required. Materials lists and revisions will be included. Text required.

IM-TEC 959 Metallurgy for the Non-Metallurgist -- 30 hours
This course offers a combination of lecture and lab consisting of an introduction to metal structure, alloying elements and methods of producing commercial metal. The usage of some common metals will be covered. Text required.

WELD 901 Welding I -- 30 hours
Course covers acetylene and electric welding, theory and applied work skills. Students furnish their own supplies; please request a supply list when registering.

WELD 921 Welding II -- 30 hours
Course covers butt welds with mild steel and low hydrogen welding rod in all positions. Students furnish their own supplies; please request a supply list when registering.

WELD 931 Welding III -- 30 hours
Building upon Welding I and II, this advanced course covers Tungsten Inert Gas (TIG) and Metallic Inert Gas (MIG) welding techniques. Please request supply list when registering.

IM-TEC 961 Pipefitting I -- 30 hours
This course covers metallic and non metallic pipe and tube, joining methods, effect on fluid flow and values. Text required.

IM-TEC 963 Pipefitting II -- 30 hours
This course builds upon Pipefitting I to cover lay-out and fitting of metallic and non metallic pipe and tube, joining methods, effect on fluid flow and values. In addition, instruction emphasizes methods for working with ABS, PCV, and poly pipe. Text required.

IM-TEC 965 Rigging -- 30 hours
This course introduces the first year millwright apprentice to the makeup and safe use of a variety of materials and equipment used for lifting and moving material. Instruction emphasizes scaffolds and loaders, as well as maintenance of hoists, pulleys, blocks and slings in conjunction with OSHA. Regulations will be included. Text required.

IM-TEC 967 Bearings/Packing and Seals -- 30 hours
This course covers types of bearings and related usage. Bearing materials, construction, lubrication, fit and tolerance, mounting and maintenance will be covered. Text required.

IM-TEC 969 Alignment & Balancing -- 30 hours
This course introduces methods of alignment and balancing of drive systems utilized in the industrial maintenance industry. Students develop knowledge and skills to verify correct drive system alignments through classroom theory and hands-on practical application. Text required.

IM-TEC 971 Conveyor & Drive Systems -- 30 hours
This course covers safety around conveyors as well as the function, materials, and construction of different types of conveyors. The maintenance including inspection and changing of belts, chains, and rollers will be included. Text required.

IM-TEC 973 Combustion Technology -- 30 hours
This course consists of the basic principles of combustion such as that used in boilers and furnaces. Covered are the basic elements of combustion including air, fuel, flame, and ignition. Text required.

IM-TEC 981 Boilers -- 30 hours
This course is an introduction to basic low pressure boiler concepts. Included will be safeguards in the system, water treatment and general personal safety. Students will be required to purchase manual.

IM-TEC 983 Refrigeration Theory I -- 30 hours
This course will cover the basics of HVAC and refrigeration systems found in most commercial buildings. Students will learn the theory of mechanical refrigeration and study its various applications. This class includes a field trip to observe commercial systems. Text Required

IM-TEC 985 Refrigeration Theory II -- 30 hours
This course builds on IM-TEC 983 to cover HVAC and refrigeration systems found in most commercial buildings. Students will learn the theory of mechanical refrigeration and study its various applications. This class includes a field trip to observe commercial systems. Text Required. Prerequisite IM-TEC 983

IM-TEC 987 Air Handling Systems -- 30 hours
This course prepares students with an overview of air handling systems for HVAC. Instruction emphasizes damper controls, zones and air balancing, filters, repairs and preventative maintenance. Text required. Prerequisite: IM-TEC 985

IM-TEC 991 TQM -- 30 hours
TQM, Total Quality Management, is the key to competitiveness! Find out about the business management method so widely and successfully used in Japan. This course includes a discussion of TQM principles and applications of those principles through group simulations. TQM is relevant for organizations of all types and sizes. Text required.

IM-TEC 993 Introduction to Computers -- 30 hours
Jump right in and find out how a computer works. Use IBM compatible computers to sample word processing, spreadsheet, and database software. Utilizing a lecture and hands-on format, instruction covers computer literacy topics in depth. Through low stress and motivating computer software, students develop touch typing skills for success with computer applications. Text required

IM-TEC 995 Safety & Hygiene I -- 30 hours
This course analyzes OSHA & WISHA safety recommendations for the workplace. Instruction covers hazard prevention and safe hygiene practices. In addition, Material Safety Data Sheet (MSDS) and requirements are analyzed.

IM-TEC 997 Safety II -- 30 hours

Basic safety subjects include tool safety, hazardous materials, personal protective equipment, rigging and slings, trenching and excavations, ladders and scaffolds, electrical safety work practices, mark and tag, confined space entry, compressed gas cylinders and fire protection. Attendees will receive a basic introduction to 12 industrial safety work practices. Text required.

BELLINGHAM TECHNICAL COLLEGE

INDUSTRIAL MAINTENANCE TECHNOLOGY (IM-TEC)

COURSE SEQUENCES

ENROLL EACH QUARTER

IMTEC 901	INDUSTRY ANALYSIS	(6 hrs. per quarter)	72 hrs.

THESE COURSES ARE SEQUENTIAL
THEY ARE PREREQUISITE TO SEQUENCE A, B, C, D, E & F

IMTEC 903	INTRODUCTION TO ELECTRICITY	30 hrs.
IMTEC 905	ELECTRICAL CIRCUITS I	30 hrs.
IMTEC 907	ELECTRICAL CIRCUITS II	30 hrs.
IMTEC 909	ELECTRICAL CIRCUITS III	30 hrs.
IMTEC 911	ELECTRICAL CONTROLS & SWITCHES	30 hrs.
IMTEC 913	ELECTRICAL TROUBLESHOOTING	30 hrs.

SEQUENCE "A"

IMTEC 915	DC MTRS & GENERATORS	30 hrs.
IMTEC 917	AC MTRS	30 hrs.
IMTEC 919	CIRCUIT PROTECTOR DEVICES	30 hrs.

SEQUENCE "B"

IMTEC 923	PROGRAM LOGIC CONTROLLERS	30 hrs.

SEQUENCE "C"		
IMTEC 925	INSTRUMENTATION	30 hrs.

SEQUENCE "D"		
IMTEC 927	SOLID STATE CONTROLS I	30 hrs.
IMTEC 929	SOLID STATE CONTROLS II	30 hrs.

SEQUENCE "E"		
IMTEC 931	ELECTRIC PROCESS HEATING	30 hrs.

SEQUENCE "F"		
IMTEC 933	TRANSFORMERS & RECTIFIERS	30 hrs.

THESE ARE SEQUENTIAL COURSES		
IMTEC 941	TRADE SCIENCE I	30 hrs.
IMTEC 943	TRADE SCIENCE II	30 hrs.

THESE ARE SEQUENTIAL COURSES		
IMTEC 951	HYDRAULICS & PNEUMATICS I	30 hrs.
IMTEC 953	HYDRAULICS & PNEUMATICS II	30 hrs.
IMTEC 955	HYDRAULICS & PNEUMATICS III	30 hrs.

THESE ARE SEQUENTIAL COURSES		
WELD 901	WELDING I	30 hrs.
WELD 921	WELDING II	30 hrs.
WELD 931	WELDING III	30 hrs.

THESE ARE SEQUENTIAL COURSES		
IMTEC 961	PIPEFITTING I	30 hrs.
IMTEC 963	PIPEFITTING II	30 hrs.

THESE ARE SEQUENTIAL COURSES		
IMTEC 983	REFRIGERATION THEORY I	30 hrs.
IMTEC 985	REFRIGERATION THEORY II	30 hrs.
IMTEC 987	AIR HANDLING SYSTEMS	30 hrs.

THESE ARE INDEPENDENT COURSES STUDENTS MAY ENROLL WITHOUT PREREQUISITES		
MATH 100	OCCUPATIONAL MATH	54 hrs.
COM 170	ORAL & WRITTEN COMMUNICATIONS	54 hrs.
HR 180	HUMAN RELATIONS	54 hrs.
IMTEC 921	PUMPS & FLOW SYSTEMS	30 hrs.
IMTEC 945	INTRO TO MACHINERY SKILLS	30 hrs.
IMTEC 947	MAINTENANCE ECONOMICS	30 hrs.
IMTEC 957	BLUE PRINT READING	30 hrs.
IMTEC 959	METALLURGY FOR THE NON-METALLURGIST	30 hrs.
IMTEC 965	RIGGING	30 hrs.
IMTEC 967	BEARINGS/PACKING & SEALS	30 hrs.
IMTEC 969	ALIGNMENT & BALANCING	30 hrs.
IMTEC 971	CONVEYOR & DRIVE SYSTEMS	30 hrs.
IMTEC 973	COMBUSTION TECHNOLOGY	30 hrs.
IMTEC 981	BOILERS I	30 hrs.
IMTEC 991	TQM	30 hrs.
IMTEC 993	INTRO TO COMPUTERS	30 hrs.
IMTEC 995	SAFETY & HYGIENE	30 hrs.
IMTEC 997	INDUSTRIAL SAFETY II	30 hrs.

BELLINGHAM TECHNICAL COLLEGE

INDUSTRIAL MAINTENANCE TECHNOLOGY (IM-TEC)

TYPICAL STUDENT SCHEDULE

Many sequential courses are offered each quarter and students may enroll in their coursework in a variety of sequences. It is strongly recommended that students enroll in the electrical sequence starting with IM-TEC 903 as soon as possible. Courses are offered during evenings (i.e., 6:00P-9:00P, 6:30P-9:30P, 7:00P-10:00P) and some Saturdays.

QUARTER 1		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 903	INTRODUCTION TO ELECTRICITY	30 hrs.
IMTEC 951	HYDRAULICS & PNEUMATICS I	30 hrs.
WELD 901	WELDING I	30 hrs.
IMTEC 969	ALIGNMENT & BALANCING	30 hrs.
	TOTAL	126 hrs.

QUARTER 2		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 905	ELECTRICAL CIRCUITS I	30 hrs.
IMTEC 941	TRADE SCIENCE I	30 hrs.
IMTEC 953	HYDRAULICS & PNEUMATICS II	30 hrs.
WELD 921	WELDING II	30 hrs.
	TOTAL	126 hrs.

QUARTER 3		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 907	ELECTRICAL CIRCUITS II	30 hrs.
IMTEC 943	TRADE SCIENCE II	30 hrs.
IMTEC 955	HYDRAULICS & PNEUMATICS III	30 hrs.
WELD 931	WELDING III	30 hrs.
	TOTAL	126 hrs.

QUARTER 4		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 909	ELECTRICAL CIRCUITS III	30 hrs.
IMTEC 973	COMBUSTION TECHNOLOGY	30 hrs.
MATH 100	OCCUPATIONAL MATH	54 hrs.
	TOTAL	120 hrs.

QUARTER 5		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 911	ELECTRICAL CONTROLS & SWITCHES	30 hrs.
IMTEC 983	REFRIGERATION THEORY I	30 hrs.
IMTEC 961	PIPEFITTING I	30 hrs.
IMTEC 945	INTRO TO MACHINERY SKILLS	30 hrs.
	TOTAL	126 hrs.

QUARTER 6		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 913	ELECTRICAL TROUBLESHOOTING	30 hrs.
IMTEC 985	REFRIGERATION THEORY II	30 hrs.
IMTEC 963	PIPEFITTING II	30 hrs.
IMTEC 967	BEARINGS/PACKING & SEALS	30 hrs.
	TOTAL	126 hrs.

QUARTER 7		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 915	DC MTRS & GENERATORS	30 hrs.
IMTEC 923	PROGRAM LOGIC CONTROLLERS	30 hrs.
COM 170	ORAL & WRITTEN COMMUNICATIONS	54 hrs.
	TOTAL	120 hrs.

QUARTER 8		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 917	AC MTRS	30 hrs.
IMTEC 987	AIR HANDLING SYSTEMS	30 hrs.
IMTEC 981	BOILERS I	30 hrs.
IMTEC 991	TQM	30 hrs.
	TOTAL	126 hrs.

QUARTER 9		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 919	CIRCUIT PROTECTOR DEVICES	30 hrs.
IMTEC 925	INSTRUMENTATION	30 hrs.
IMTEC 921	PUMPS & FLOW SYSTEMS	30 hrs.
IMTEC 947	MAINTENANCE ECONOMICS	30 hrs.
	TOTAL	126 hrs.

QUARTER 10		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 927	SOLID STATE CONTROLS I	30 hrs.
IMTEC 957	BLUE PRINT READING	30 hrs.
HR 180	HUMAN RELATIONS	54 hrs.
	TOTAL	120 hrs.

QUARTER 11		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 929	SOLID STATE CONTROLS II	30 hrs.
IMTEC 997	INDUSTRIAL SAFETY II	30 hrs.
IMTEC 959	METALLURGY FOR THE NON-METALLURGIST	30 hrs.
IMTEC 965	RIGGING	30 hrs.
	TOTAL	126 hrs.

QUARTER 12		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 931	ELECTRIC PROCESS HEATING	30 hrs.
IMTEC 933	TRANSFORMERS & RECTIFIERS	30 hrs.
IMTEC 993	INTRO TO COMPUTERS	30 hrs.
IMTEC 995	SAFETY & HYGIENE	30 hrs.
	TOTAL	126 hrs.

QUARTER 13		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
IMTEC 971	CONVEYOR & DRIVE SYSTEMS	30 hrs.
ELECTIVE COURSEWORK		90 hrs.
	TOTAL	126 hrs.

QUARTER 14		
IMTEC 901	INDUSTRY ANALYSIS	6 hrs.
ELECTIVE COURSEWORK		120 hrs.
	TOTAL	126 hrs.

QUARTER 15		
IMTEC 901 INDUSTRY ANALYSIS		6 hrs.
ELECTIVE COURSEWORK		48 hrs.
	TOTAL	54 hrs.

BELLINGHAM TECHNICAL COLLEGE

INDUSTRIAL MAINTENANCE TECHNOLOGY (IM-TEC)

STUDENT PLANNING SHEET

1) Enrollment in the program _____

2) Completion of the College Placement Test (CPT) _____

QUARTER 1

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

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QUARTER 2

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

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QUARTER 3

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

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QUARTER 4

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 5

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 6

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 7

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 8

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 9

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 10

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 11

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 12

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 13

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 14

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

QUARTER 15

IMTEC 901 INDUSTRY ANALYSIS 6 hrs.

IM-TEC BOOK LIST

Note: This list was developed as a student guide and may be changed without notice. Students are cautioned to check with the Book Store each quarter to ascertain books being used.

IM-TEC 901 Industry Analysis -- no book

MATH 100 Occupational Math -- Basic College Math. Harper Collins

COM-170 Oral & Written Communications -- Professional & Technical Writing Skills. Prentice Hall.

HR - 180 Human Relations -- book tba

IM-TEC 903 Introduction to Electricity -- electricity one-seven

IM-TEC 905 Electrical Circuits I -- electricity one-seven

IM-TEC 907 Electrical Circuits II -- electricity one-seven

IM-TEC 909 Electrical Circuits III -- electricity one-seven

IM-TEC 911 Electrical Controls and Switches -- electricity one-seven

IM-TEC 913 Electrical Troubleshooting -- electricity one-seven

IM-TEC 915 DC Motors & Generators -- electricity one-seven

IM-TEC 917 AC Motors -- electricity one-seven

IM-TEC 919 Circuit Protector Devices -- book tba

IM-TEC 921 Pumps and Flow Systems -- Millwright and Mechanics Guide. Audel

IM-TEC 923 Programmable Logic Controllers -- Technicians Guide to Programmable Controllers. Delmar

IM-TEC 925 Instrumentation -- Process Control. Instrumentation Society of America

IM-TEC 927 Solid State Controls I -- DC Electronics, DC Electronics Workbook & DC Parts Kit. Heath.

IM-TEC 929 Solid State Controls II -- Semi Conductors, Semi Conductors Work Book, & Semi Conductors Parts Kit. Heath.

IM-TEC 931 Electric Process Heating -- Electricity II, delMar

IM-TEC 933 Transformers & Rectifiers -- electricity one-seven

IM-TEC 941 Trade Science I -- Millwright and Mechanics Guide. Audel
Basic Technical Physics. Glencoe

IM-TEC 943 Trade Science II -- Millwright and Mechanics Guide. Audel
Basic Technical Physics. Glencoe
Fundamentals of Applied Mechanics. Delmar

IM-TEC 945 Introduction to Machinery Skills -- Recommended: Machinery's Handbook. Industrial Press. (NOT REQUIRED)

IM-TEC 947 Maintenance Economics -- no book

IM-TEC 951 Hydraulics & Pneumatics I -- Industrial Hydraulics. Vickers.

IM-TEC 953 Hydraulics & Pneumatics II -- Industrial Hydraulics. Vickers

IM-TEC 955 Hydraulics & Pneumatics III -- Industrial Hydraulics. Vickers

IM-TEC 957 Blue Print Reading -- Machine Trades Blueprint Reading. delmar.

IM-TEC 959 Metallurgy for the Non-Metallurgist -- Metallurgy for the Non-Metallurgist

WELD 901 Welding I -- Recommended: Procedure Handbook of Arc Welding

WELD 921 Welding II -- Recommended: Procedure Handbook of Arc Welding

WELD 931 Welding III -- Recommended: Procedure Handbook of Arc Welding

IM-TEC 961 Pipefitting I -- Millwright and Mechanics Guide. Audel

IM-TEC 963 Pipefitting II -- Millwright and Mechanics Guide. Audel

IM-TEC 965 Rigging -- Millwright and Mechanics Guide. Audel

IM-TEC 967 Bearings/Packing and Seals -- Millwright and Mechanics Guide. Audel
Installing & Replacing Bearings & Shaft Seals.
TPC. SFK Bearing Maintenance Handbook.

IM-TEC 969 Alignment & Balancing -- Millwright and Mechanics Guide. Audel

IM-TEC 971 Conveyor & Drive Systems -- Millwright and Mechanics Guide. Audel

IM-TEC 973 Combustion Technology -- book tba

IM-TEC 981 Boilers -- Low Pressure Boilers. Boiler Fundamentals. NVS Training Corp.

IM-TEC 983 Refrigeration Theory I -- Refrigeration & Air Conditioning Technology. Delmar.

IM-TEC 985 Refrigeration Theory II -- Refrigeration & Air Conditioning Technology. Delmar.

IM-TEC 987 Air Handling Systems -- book tba

IM-TEC 991 TQM -- Dr. Demming - The American who Taught the Japanese About Quality. Simon & Schuster.

IM-TEC 993 Introduction to Computers

IM-TEC 995 Safety & Hygiene I

IM-TEC 997 Safety II -- C-STOP Student Manual

About the Author

Gene Fusch is a third year Ph.D. student in the Higher Education Program at the University of British Columbia. His research encompasses work organization, motivation and learning at the workplace.

Along with pursuing his doctoral research, he is the Coordinator of Trades and Technology at Bellingham Technical College in Bellingham, Washington, USA. At Bellingham Technical College, he supervises the apprenticeship programs, develops and manages industry upgrade courses and technology degree programs. He specializes in consulting and implementing customized training courses for industry. He is responsible for 90 full-time and adjunct faculty that teach 120 to 140 competency based courses each quarter.

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