



HENRY FORD COMMUNITY COLLEGE



Course Syllabus

(Form revised January, 2010)

I. Division: Energy Technology Department

II. Course Number and Title: MMFT-114 Energy Conversion Tools, Instruments, Processes

III. Credit Hours: 3

IV. Total Contact Hours: 47

V. Prerequisites: None

VI. Co-requisites: None

VII. Required Texts & CD-ROM

1. Industrial Maintenance, ATP, 2nd Edition (IMTB)
2. Industrial Maintenance Workbook, ATP, 2nd Edition (IMWB)
3. Practical Science and Engineering Manual & Workbook on CD-ROM – (PSEM)

VIII. Course Grading Scale: A through Incomplete.

1. Grading will be divided among four major assignment groups each of which will count towards 25% of the course grade.

A. Complete entire Industrial Maintenance Workbook Review questions for chapters 1-11. Complete Industrial Maintenance Activities for chapters 2, 3, 7,

9 and 10.

B. Completion of assignments from the Practical Science & Engineering Manual & Workbook and listed under the assignments section of this course.

C. Successful completion of objective answer exams and quizzes through U-Compass online. These tests may be taken as many times as the student wants and students are expected to earn 100% on each test while a test may not be able to be submitted with less than 70% correct.

D. Completion of four objective answer final exam tests through U-Compass online. You may take as much time for these tests as you need but they may only be accessed once. These are to be taken upon completion of all other requirements. Most of the questions will come from questions selected from the online tests.

2. You must receive a 95% or better to receive an A for the course.

3. GRADING SCALE; 94-85: B, 84-75: C, 74-70: D, >70: INCOMPLETE.

IX. General Course Requirements and Recommendations

1. Assessment of Academic Achievement

A. Students in this course meet minimum testing standards as required by Energy Technology Department standardized tests for each course. Students complete the required tests on U-Compass at the point required during the semester.

B. Assessment of student achievement in online study assignments and exercises is left to the discretion of the individual instructor.

2. Students are required to complete exercises and testing using basic computer skills. On-line students taking this course must have regular access to a home computer connected to an appropriate Internet service.

The **Lowest Common Denominator** technical requirements for taking this online course are summarized below: PC (IBM compatible):

Pentium II (233 MHz minimum, higher recommended)

- Windows 98, NT, or higher
- 256 MB Ram
- 12x CD-ROM (CD/DVD Recommended)
- Internet connection of at least 56k

3. Students will need to be able to mail the completed assignment materials to the instructor for review and grading. A large clasp envelope should be adequate to return materials. Mailing costs will have to be covered by the student and

should not exceed \$5.00 US. Materials will be returned if a prepaid return envelope is included in the mailing.

X. Catalog Description: A basic on-line course in applied power and process plant heat fundamentals and introductory industrial maintenance designed to provide introductory practical science studies for students entering the power, facilities and process operation and maintenance fields. The course is designed to provide a basic background for entry level persons preparing to take boiler and steam licensing exams and to prepare them to function effectively as multi-skilled power or process plant engineers, building engineers, boiler operators or heating plant operators. Students study tools, materials, basic maintenance processes, heat fundamentals, basic power plant science, operation and maintenance activities by applying these principles and related power and heating plant operational concepts to workplace situations. Students may (as an option to the course) operate equipment in a state-of-the-art cogeneration power plant laboratory setting. Workbook exercises which duplicate workplace skills and experiences are provided and meet or exceed requirements of National Skill Standards for Power Engineering and Facilities Engineering.

XI. Measurable Objectives - Major Core Course Objectives

1. Completes properly written Reports-Memos-Work Orders as specified in workbook exercises.
2. Completes Drawing-Sketching-Lettering exercises as specified in workbook exercises.
3. Completes written Technical Article Review-Reports including those obtained from research for articles on the Internet.
- *4. Identifies components and fasteners and identifies the proper use of precision measurement instruments, gages, tools and other equipment to determine dimensions on electrical and mechanical components such as on fasteners, nuts and bolts and other materials and equipment.
- *5. Identifies the proper use of measuring tools and instruments to determine volume, linear measurements, flow measurements and level measurements to determine capacities of tanks, mechanical systems and equipment.
6. Completes problems and exercises according to workbook requirements for weights, measures, levers, mechanical systems, Stresses in Pressure Vessels and for Force, Pressure, Work, Energy, Power.
- *7. Completes workbook exercises as specified for Basic Thermodynamics-Heat Temperature and Steam including using the Steam Tables
- *8. Completes workbook exercises as specified for Gases including study and exercises for Basic Thermodynamics of Gases, Air Compression, and Compressors
- *9. Completes workbook exercises as specified for Fuels-Combustion - Basic Fuel Origin-Properties, Measuring Combustion and Combustion Efficiency and Flue Gas Analysis- for Boiler or Heating Units
10. Completes workbook exercises as specified for Refrigeration, HVAC Air Conditioner Operation -Air Flow Measurement including identification and

operation of Heating, Ventilating and Air Conditioning Systems

*11. Completes workbook exercises as specified for Hydraulics, Basic-Gages, Piping, Valves, Pump Calculations, Theory, Pumps, Pumping Systems, Hydraulics, Pneumatics, Pumps

12. Completes Workbook exercises for Measuring Level and Flow

13. Completes Workbook Exercises for Measuring-Testing Pressure

*14. Identifies and completes exercises as specified on methods for controlling equipment and systems including those for process control boiler control and heating plant control

15. Sketches Control Diagrams or power and heating systems and Systems including those for Boiler & Special power plant Control Systems

XII. Core Course Topics - Industrial Maintenance 2nd Edition Chapter Titles

1. MAINTENANCE PRINCIPLES – Maintenance Organizations, Preventive Maintenance, Predictive Maintenance, Total Quality Maintenance, Trouble Shooting, Interpersonal Skills, Advancement in Maintenance Skills.

In addition from PSEM: Communication, Reporting, Reports-Memos-Work Orders, Mechanical Drawing/Layout, Technical Article Review-Reporting. (Learning, Education, Training. Communication Wheel of Progress.)

2. SAFETY - Regulatory Agencies, Codes & Standards, Personal Protective Equipment, Fire Safety, Electrical Safety, Lockouts & Tagouts, Confined Spaces, Emergency Plans, Hazardous Materials, Industrial Hygiene, Blood borne Pathogens, First Aid.

In addition from PSEM: Maintenance Safety for maintenance shop, operations, hand and power tools.

3. SERVICE & REPAIR PRINCIPLES – Equipment Operation Principles, Service & Repair Documents, Service & Repair Procedures, Tools, Inventory Management.

In addition from PSEM: Using Tools, Instrument, Measuring-Calculating-Materials, Weights, Measures and Math, Piping and, Industrial Maintenance Service and Repair Principles, Basic Thermodynamics-Heat Transfer-Measurement - Basic Force, Pressure, Work, Energy, and Power Principles, Basic Maintenance Skills and operations-rigging, cutting, welding, basic bench and machine tool operations.

4. ELECTRICAL SYSTEMS – Electrical Principles, Electrical Circuits, Drawings & Diagrams, Power Distribution, Electrical Test Equipment, Power Quality, Troubleshooting Electrical Systems. Preventive Maintenance

In addition from PSEM: Electrical Control Systems and Controlling Power Engineering Systems.

5. ELECTRONICS & PROGRAMMABLE CONTROLLERS – Electronics, Solid-State Semiconductor devices, Programmable Controllers.

In addition from PSEM: Electrical, Electronic Controls.

6. REFRIGERATION SYSTEMS – Refrigeration, Mechanical Compression Refrigeration, Absorption Systems, Troubleshooting & Maintaining Refrigeration Systems, Refrigerant Regulations, Refrigerant Handling.

In addition from PSEM: Tubing-Fabrication, brazing, soldering.

7. BOILER SYSTEMS – Boiler Applications, Boiler Operation Principles, Boilers, Boiler fittings & Accessories, Combustion, Draft, Boiler Operation procedures, Boiler Maintenance Procedures, Troubleshooting Boiler Systems, Boiler emergency, Preparation for Boiler Inspection, Boiler Lay-Up, Basic Heat and Power Plant Water Treatment.

In addition from PSEM: Basic Thermodynamics - Heat, Steam, Calorimeters. Compression - gases, gas laws, measuring heat, temperature, pressure flow and level. Strength of Drums, Shells & Joints, Basic Fuels and Combustion, flue gas analysis and combustion efficiency measuring.

8. HEATING VENTILATING & AIR CONDITIONING SYSTEMS – HVAC System Operation, Pneumatic Controls, Direct Digital Controls, Troubleshooting & Maintaining HVAC, Indoor Air Quality, Troubleshooting Indoor Air Quality (IAQ) Problems.

In addition from PSEM: Basic refrigeration and air conditioning, Air Conditioner Operation, Air Flow Measurement, Heating, Ventilating & Air Conditioning system capacity checking, Checking-Testing Air/Humidity and Psychrometrics.

9. MECHANICAL SYSTEMS – Lubricants, Bearings, Oil Seals, Mechanical Drive Systems, Coupling, Pullers, Shaft Alignment, Pulley & Sprocket Alignment, Preventive Maintenance, Troubleshooting Mechanical Systems.

In addition from PSEM: Basic pumps, valve and process systems.

10. FLUID POWER SYSTEMS – Hydraulic Principles, Hydraulic Systems, Hydraulic System Maintenance, Troubleshooting Hydraulic Systems, Hydraulic System Safety, Pneumatic Principles, Pneumatic System Maintenance, Pneumatic System Safety, Troubleshooting Pneumatic systems.

In addition from PSEM: Basic principles of Hydraulics-Pressure/Flow and Basic Mechanical Systems

11. TROUBLESHOOTING – Maintenance & Troubleshooting, Maintenance and Troubleshooting Resources, Troubleshooting Problems.