MOHAWK VALLEY COMMUNITY COLLEGE

UTICA AND ROME, NEW YORK

COURSE OUTLINE

Introduction to Geothermal Heating & Cooling C-3, Cr-3

FM247

CATALOG DESCRIPTION:

### FM247 Introduction to Geothermal Heating & Cooling C-3, Cr-3

This course addresses the theory of operation of residential and commercial geothermal systems. Topics include the science and principles of heat transfer, convection and infrared, and identification of the best system for application and budget. Market values, tax incentives, and rebates for these systems are discussed as well as system configurations, system sizing, and design.

Student learning outcomes:

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

* Evaluate systems design for Geothermal installations
* Develop a complete geothermal system for industrial use.
* Plan a site survey
* Determine the best geothermal style system for customer’s application
* Interface with local codes department prior to installation
* Determine best utility connection for customer

DETAILED COURSE OUTLINE:

# 1. Introduction

(3 period)

1. Reducing carbon emissions
2. Define Earth Coupled
3. Geothermal Cooling
4. Geothermal Technologies

# 2. Heat Transfer and HVAC Basics (3 period)

1. Understanding Heat Transfer
2. Components of a geothermal system
3. Heat Pumps
4. Chillers
5. Direct Expansion Systems

# 3. Geothermal Heat Pumps and Their Uses (3 period)

1. Passive and Forced Air Earth Coupled Duct Systems
2. Water Source Forced Air Heat Pumps
3. Direct Expansion Geothermal heat Pumps
4. Process cooling & Heating
5. Package Terminal heat Pumps
6. Vertical Stack Modular Units

# 4. Earth Coupling through Ground Loops (3 period)

1. Components
2. Sizing
3. Pumps & reinjection
4. Loop Designs

# 5. Introduction to Load Sharing (3 period)

1. Benefits of Load Sharing
2. Earth Coupling as a Thermal Savings Bank
3. Case Studies

# 6. Efficiencies & Load Calculations (3 period)

1. Rating Geothermal Systems
2. Annual Fuel Utilization Efficiencies
3. Cooling loads
4. Coefficient of Performance
5. Energy Efficiency Ratio

# 7. Understanding Pricing of Geothermal Systems (3 period)

1. Factors that effect Cost
2. Quality
3. Efficiency
4. Topology
5. Load Sharing
6. Heat Recovery
7. Exchanger Materials
8. Compressor Stages

# 8. Incentives & Tax Rebates (3 period)

1. U.S Federal Tax Rebates
2. Commercial Tax Credits
3. The Feingold-Ensign Support Renewable Energy Act
4. Home Star Nuclear Energy and Carbon Emissions

# 9. Understanding Geothermal Project Proposals (3 period)

1. Typical HVAC Proposals
2. What to Include
3. What not to include

Sizing costs

# 10. How to Calculate Your Payback

(3 period)

1. Determining your ROI on Residential & Commercial systems
2. ROI on Heat pumps
3. Mechanical Integration

# 11. Verifying Your System

(3 period)

1. Actual SEER & EER Results
2. Factors that affect Efficiency
3. How to Calculate Your Own EER
4. Data Points
5. Minimum Efficiency Standards

# 12. Life Cycles & Longevity

(3 period)

1. The Benefits of Indoor Equipment
2. How to Determine When Upgrades Payoff

# 13 Common Problems & Horror Stories

(3periods)

1. Water Conservation
2. Pressurized Pockets
3. Broken or Damaged Loops

# 14 Geothermal Spreads Around the Globe

(4 periods)

1. Australia
2. China
3. Europe
4. South Korea
5. Western Europe

15 Project Analysis

1. Putting It All Together